AMERICA'S ROLE IN THE WORLD COAL EXPORT MARKET
(PACIFIC RIM OUTLOOK)

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY AND MINERAL RESOURCES

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

FIRST SESSION

on the

DEMAND OF PACIFIC RIM COAL CONSUMING NATIONS

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AMERICA'S ROLE IN THE WORLD COAL MARKET: DEMAND OF PACIFIC RIM COAL CONSUMING NATIONS

TUESDAY, DECEMBER 1, 1981

U.S. Senate,
Subcommittee on Energy and Mineral Resources,
of the Committee on Energy and Natural Resources,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:30 a.m., in room 3110, Dirksen Office Building, Hon. John W. Warner presiding.

Present: Senators Warner and Murkowski.

Also present: Roger Sindelar, counsel; D. Michael Harvey, chief counsel for the minority; and Ron Andes, congressional fellow.

OPENING STATEMENT OF HON. JOHN W. WARNER, A U.S. SENATOR FROM THE STATE OF VIRGINIA

Senator Warner. Today, this subcommittee turns its attention to the burgeoning coal demand of the Pacific rim countries.

In the past America has provided metallurgical coal for the Pacific rim steel industries from its mines in the East. As the demand for steam coal to produce electrical power grows throughout the Pacific rim traditional American coal production for this market has begun to shift in ever increasing numbers to the coal mines located in America's West.

Shipments of American coal are currently moving through the ports of New Orleans, Los Angeles, and Long Beach bound for energy hungry Pacific rim nations. On the drawing boards are plans for additional western coal ports at Portland, Astoria and Coos Bay, Oreg., Kalama and Puget Sound, Wash., and Seward, Alaska, to name a few.

Coal located in the States of Utah and Colorado is being developed and moved into the Pacific rim markets with coal deposits in Wyoming and Montana awaiting the opportunity to enter this fast growing area.

A recent development in the export market has been the interest shown by Pacific rim nations in Alaska's abundant coal reserves. Alaska's close proximity to the Pacific rim market coupled with its large reserves of low sulfur coal place it in an advantageous position to compete against the traditional Pacific rim coal suppliers of Australia, Canada, and South Africa.

The selling of coal to the Pacific rim differs vastly from that of selling coal to the European markets. America faces different internal problems to meet the Pacific rim countries needs as well as different business practices, customs, logistics, needs, and competition.

By and large the Pacific rim countries have been longstanding allies with America and are linked to this country through mutual defense treaties as well as strong economic ties.

Energy has become an integral part of a nation's national security system. A nation without an adequate supply of energy has the potential for internal instability that can affect its international dealings in the world community.

Implicit in our mutual defense treaties with our Pacific rim allies is that America will provide the energy needed for internal stability.

It is my intent to see that America carries out this necessary task.

This subcommittee looks to our Pacific rim customers for guidance on how America can best meet this obligation.

Taiwan Power Co., who is unable to be here today, has submitted a statement for the record on the policies and programs of the Republic of China in Taiwan for assuring an adequate supply of coal.

We are, however, very privileged to have with us today a series of witnesses, each of whom will be given, I hope, today, adequate opportunity to express their viewpoints. Again, I express my apologies to those who were present at the previous hearing. The time for the testimony was severely curtailed, but curtailed for reasons totally beyond the control of the Chair. We had a rule in the Senate in which any Senator can vote, prohibiting the holding of hearings during the session of the Senate.

And for reasons unknown to the Chair that was done last time, but there is no expectation today that that rule will be in effect. We will therefore have adequate time for our witnesses.

[The statement from the Taiwan Power Co. follows:]

WASHINGTONDC

NO.256

POLICIES AND PROGRAMS OF THE REPUBLIC OF CHINA IN TAIWAN FOR ASSURING AN ADEQUATE SUPPLY OF COAL

(PRESENTATION ON NOVERMBER 13, 1981 TO THE ENERGY AND MINERAL RESOURCES SUBCOMMITTEE OF THE US SENATE, BY DAVID LAN CHENG, VICE PRESIDENT, TAIWAN POWER COMPANY)

1. CURRENT AND ANTICIPATED COAL NEEDS:

COAL DEMAND IN TAIWAN HAS INCREASED REPIDLY DURING THE PAST THREE YEARS, DUE TO THE FAVORABLE PRICE OF COAL IN COMPARISON TO OIL, - AND IN RESPONSE TO SPECIFIC POLICIES BY THE GOVERNMENT TO INCREASE COAL USE AND REDUCE OIL CONSUP// CONSUMPTION. TABLE 1 SHOWS SUPPLY AND DEMAND OF COAL DURING THE PAST FIVE YEARS. I WOULD EMPHASIZE THAT OUR INCREASED REQUIREMENTS HAVE BEEN OBTAINED ENTIRELY THROUGH IMPORTS, AS OUR DOMESTIC MINES CANNOT FA//' FEASIBLY INCREASE THEIR PRESENT LEVEL OF PRODUCTION.

COAL REQUIREMENTS IN TAIWAN WILL CONTINUE TO RISE RAPIDLY. STEAM COAL WILL BE THE MAJOR FUEL FOR FOSSIL POWER GENERATION, CEMENT PRODUCTION AND OTHER INDUSTRIAL APPLICATIONS, REPLACING OIL WHEREVER POSSIBLE IN EXISTING AND NEW INSTALLATIONS. TABLE 2 SHOWS OUR OFFICIAL DEMAND PROJECTIONS FROM NOW THROUGH 1995 FOR STEAM COAL AND COKING COAL. THE RECENT SLOWDOWN IN OUR ECONOMIC GROWTH, DUE TO WORLD-WIDE DEPRESSED ECONOMIC CONDITIONS, WILL REDUCE THESE ESTIMATES TO SOME EXTENT., I WILL BE HAPPY TO FURNISH YOU, EARLY NEXT YEAR, OUR REVISED FORECASTS. PLEASE NOTE THAT ALL OUR INCREASED COAL REQUIREMENTS WILL BE IMPORTED.

TABLE 1

COAL SUPPLY AND DEMAND IN TAIWAN

1976-1980

UNIT: MILLION METRIC TONS

YEAR	SUPPLY			
	DOMESTIC PRODUCTION	IMPORTS	TOTAL SUPPLY	DEMAND
1976	3.24	0.11	3.35	3.37
1977	2.96	0.34	3.30	3.33
1978	2.88	1.37	4.25	3.96
1979	2.72	2.29	5.01	5.04
1980	2.57	4.64	7.21	6.96

TABLE 2

ESTIMATED COAL DEMAND IN TAIWAN

1981-1995

UNIT: MILLION METRIC TONS

STEAM COAL

	DEMAND			SUPPLY		
YEAR	ELECTRIC UTILITY	INDUSTRY	TOTAL	DOMESTIC	IMPORTS	COKING COAL (ALL IMPORTED)
1981	2.9	3.0	5.9	2.6	3.3	1.3
1982	3.7	3.8	7.5	2.6	4.9	1.9
1983	5.2	4.6	9.8	2.6	7.2	2.7
1984	8.0	5.5	13.5	2.6	10.9	2.7
1985	10.7	5.9	16.6	2.6	14.0	2.7
1986	12.0	6.3	18.3	2.6	16.7	2.7
1987	14.3	6.8	21.1	2.6	18.5	3.2
1988	17.8	7.3	25.1	2.6	22.5	4.4
1989	21.1	7.8	28.9	2.6	26.3	4.7
XXXXXXXXX		XXX	XXXX			
1990	21.2	8.3	29.5	2.6	26.9	5.2
1991	21.7	8.8	30.5	2.6	27.9	6.8
1992	23.2	9.5	32.7	2.6	30.1	6.8
1993	24.8	10.1	34.9	2.6	32.3	6.8
1994	28.1	10.7	38.8	2.6	36.2	6.8
1995	30.9	11.4	42.3	2.6	39.7	6.8

2. THE COAL MINING INDUSTRY IN TAIWAN:

COAL HAS BEEN MINED IN TAIWAN FOR MANY YEARS, BUT IT OCCURS IN THIN, STEEPLY DIPPING SEAMS IN GEOLOGICALLY DISTURBED AREAS. DOMESTIC COAL PRODUCTION PEAKED AT 5.1 MILLION METRIC TONS IN 1967 AND SINCE THEN HAS BEEN DECLINING, AS CONFIRMED BY THE FIGURES IN TABLE 1. COAL IMPORTED FROM SOUTH AFRICA NOW COSTS LESS THE// THAN COAL MINED IN TAIWAN, AND IMPORTS FROM THE US ARE ONLY SLIGHTLY MORE EXPENSIVE.

WE PLAN TO MAINTAIN LOCAL COAL PRODUCTION AT ITS CURRENT LEVEL OF 2.6 MILLION METRIC TONS ANNUALLY, IN LINE WITH OUR NATIONAL POLICY OF DIVERSIFIED ENERGY SOURCES AND MEXIMUM INDIGENOUS SUPPLY.

3. GOVERNMENT POLICIES TO ENCOURAGE CONTINUED AND INCREASING USE OF COAL:

THE ENERGY POLICY OF THE REPUBLIC OF HIN// CHINA IS TO ASSURE AN ADEQUATE, ECONOMICAL SUPLY// SUPPLY, THROUGH DIVERSIFICATION OF ENERG TYPES AND SOURCES. WE ARE COMMITTED TO MZ// MAXIMIZE THE FUTURE USE OF COAL FOR EE FOSSIL POWER GENERATION, CEMENT PRODUCTUION, STEEL MAKING AND OTHER APPLICABLE INDUSTRIAL USES. ALL FUTURE CONVENTIONAL THERMAL POWER UNITS WILL HAVE FULL COAL-FIRING CAPABILITY. TAX INCENTIVES ARE EXTENDED TO CEMENT PLANTS WHICH CONVERT TO COAL. LARGE SCALE COAL TRANSPORTATION AND HANDLING FACILITIES HAVE ALREADY BEEN APPROVED. OUR MAJOR COAL USERS SUCH AS THE TAIWAN POWER COMPANY HAVE BEEN INSTRUCTED TO IMPORT COAL UNDER LONG-TERM CONTRACTS. TABLE 3 SHOWS THE AMOUNTS AND SOURCES

COAL CONTRACTED BY TAIPOWER
FOR
DELIVERY IN 1981-2000

UNIT: MILLION METRIC TONS

YEAR OF DELIVERY	SOURCE				
	USA	AUSTRALIA	SOUTH AFRICA	CANADA	TOTAL
1981	2.12	0.59	0.63	0	3.34
1982	2.20	0.65	0.50	0.04	3.39
1983	2.76	0.85	0.70	0.70	4.67
1984	3.17	0.90	0.90	0.50	5.47
1985	3.37	1.20	0.90	1.50	6.97
1986	3.90	1.40	0.50	3.00	8.80
1987	4.40	1.40	0.50	3.00	XXXX 9.30
1988	4.40	1.50	0.50	3.00	9.40
1989	4.90	1.50	0.50	3.00	9.90
1990	2.30	1.00	0.50	3.50	7.30
1991	1.00	0.50	0	3.50	5.00
1992	1.00	0.50	0	3.50	5.00
1993	1.00	0.50	0	3.50	5.00
1994	1.00	0.50	0	3.50	5.00
1995	0	0.50	0	3.50	4.00
1996	0	0.50	0	3.50	4.00
1997	0	0.50	0	3.50	4.00
1998	0	0.50	0	3.50	4.00
1999	0	0.50	0	3.50	4.00
2000	0	0.50	0	3.50	4.00

-----(ABOVE CANADA 3LINE 0.70 PLS CRT TO 0.36 TKS)

OF COAL ALREADY UNDER CONTRACT BY TAIPOWER FOR DELIVERY FROM 1981 THROUGH THE YEAR 2000. OUR GOVERNMENT ALSO STRONGLY ENCOURAGES MINORITY PARTICIPATION IN OVERSEAS COAL MINING VENTURES, AS W//
XXXIXXXXSXIXWIKKXBIE
AS I WILL DISCUSS LATER IN MORE DETAIL.

4. PORTS, COASTAL AND INLAND TRANSPORTATION FACILITIES FOR COAL IN TAIWAN:

THE AREA OF TAIWAN IS ONLY 13,900 SQUARE MILES AND MOST OF THE COAL WE IMPORT IS BURNED WITHIN A FEW MILES OF A MO// MAJOR PORT. TWO HARBORS, TAICHUNG ON THE WEST COAST AND SUAO ON THE NORTHEAST COAST, CAN ALREADY ACCOMMODATE 65,000 TON COAL CARRIERS. A NEW COAL FACILITY WILL BE COMPLETED AT KAOHSIUNG BY THE END OF 1982 WHICH CAN HANDLE VESSELS UP TO 100,000 TONS AND RECEIVE UP TO 2.5 MILLION MT OF COAL ANNUALLY. ADDITIONAL PORT FACILITIES ARE BEING PLANNED, AS SHOWN IN TABLE 4, WHICH WILL BE ABLE TO QUICKLY UNLOAD THE LARGEST CLASS OF COAL CARRIERS AND RELIABLY HANDLY/// HANDLE PROJECTED COAL IMPORTS.

TWO COASTAL XXREE BARGE UNITS OF 10,000 MT CAPACITY ARE ALREADY ON ORDER TO CARRY COAL FROM THE MAJOR HARBORS TO THERMAL GENERATING STATIONS ALONG THE COAST. OUR DOUBLE G/ TRACK RAIL SYSTEM AND FOUR LA LANE SUPERHIGHWAY SYSTEM CAN EASILYHANDLE THE RELATIVELY SMALL AMOUNT OF COAL TRANSPORTED TO INLAND LOCATIONS FROM OUR DOMESTIC MINES AND INTERNATIONAL COAL HARBORS.

TABLE 4

PROPOSED COAL UNLOADING TERMINALS

	CAPACITY	VESSEL SIZE

TABLE 4

PROPOSED COAL UNLOADING TERMINALS

CAPACITY VESSEL SIZE

(MILLION MT/YR)

TABLE 4

PROPOSED COAL UNLOADING TERMINALS

TERMINAL	CAPACITY (MILLION MT/YR)		VESSEL SIZE (103TON DWT)		STOCKYARD
	INITIAL	FINAL	INITIAL	FINAL	(HA)
TA-LIN COAL UNLOADING TERMINAL	2.5	5.0	100	130	24
CENTRAL COAL UNLOADING TERMINAL	6.5		60		
SU-AO COAL UNLOADING TERMINAL	6.5	15.0	150	200	62
HSIN-TA COAL UNLOADING TERMINAL	7.5	15.0	130	200	70
SHEN-AO COAL UNLOADING TERMINAL		4.0	35	60	40

(LAST LINE)
DATE OF INITIAL
OPERATION

DECEMBER 1982

MARCH 1987

NOVERMBER 1985

APRIL 1995

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5. POTENTIAL COAL SUPPLIERS AND PLANS FOR INVESTMENT IN OVERSEAS COAL MINING DEVELOPMENTS:

COAL IMPORTED BY TAIWAN NOW COMES ALMOST ENTIRELY FROM THE US, SOUTH AFRICA, AUSTRALIA AND CANADA, AS INDICATED BY THE FOLLOWING SUMMARY OF IMPORTS IN 1980.

COAL IMPORTS, IN THOUSAND METRIC TONS

SOURCE	FOR POWER GENERATION	FOR STEEL MAKING	TOTAL
US	400	280	680
SOUTH AFRICA	1,750	--	1,750
AUSTRALIA	820	750	1,570
CANADA	--	140	140
TOTAL	2,970	1,170	4,140

⊙DOES NOT INCLUDE 455,000 TONS OF STEAM COAL AND 40,000 TONS OF COKING COAL IMPORTED BY INDUSTRIES.

WE ANTICIPATE THAT THESE FOUR NATIONS WILL FURNISH A MAJOR PORTION OF FUTURE COAL IMPORTS. OUR GOVERNMENT ENCOURAGES LONG-TERM COAL CONTRACTS WITH PRIMARY PRODUCERS WHO CAN GUR// GUARANTEE THE QAANTITY AND QUALITY REQUIRED.

EARLY IN 1981 TAIPOWER EXECUTED AN ~~AGREEMENT~~ AGREEMENT WITH A CANADI COMPANY AND PARTNERS IN FRANCE, GERMANY AND JAPAN, FOR 10-0/0 PARTICIPATION IN A COAL MINE DEVELOPMENT PROJECT IN ALBERTA WHICH WI EXTRACT 5 MILLION METRIC TONS A YEAR IN THE INITIAL STAGE. TAIPOWER WILL TAKE 50-0/0 OF THIS OUTPUT.

OUR GOVERNMENT ENCOURAGES THE MAJOR COAL USERS IN TAIWAN TO PARTICIPATE AS PARTNERS IN COAL MINING VENTURES IN THE US AND OTHER FRIENDLY FREE WORLD COUNTRIES. WE GIVE GREAT WEIGHT TO RELIABILITY OF SUPPLY, FROM THE MINE TO OUR B// HARBORS IN TAIWAN. SUCH RELIABILITY REQURIES A FIRM ASSURANCE OF INLAND TRANSPORTATION AND PORT FACILITIES IN THE SUPPLYING NATION.

Senator **Warner**. Our first witness is Norman G. Wilson-Smith, president, Zinder-Neris, Inc., accompanied by Dr. George Ecklund, vice president, Zinder-Neris, Inc. We welcome you.

STATEMENT OF NORMAN G. WILSON-SMITH, PRESIDENT, ZINDER-NERIS, INC., NEW YORK, N.Y., ACCOMPANIED BY DR. GEORGE ECKLUND, VICE PRESIDENT, ZINDER-NERIS, INC.

Mr. **Smith**. Mr. Chairman, ladies and gentlemen, I wish to thank the subcommittee for inviting me to present our impressions and forecasts of the Far East coal export market.

As the chairman mentioned, up until recently our coal exports to the Far East were almost exclusively metallurgical coal to fuel the steel industry. The market continues to exist, but its demand is flat and we have lost a great deal of this Far East market to Australia and Canada. And for this reason I will limit my remarks to the rising steam coal trade.

The reasons for this booming new international market in steam coal are now well understood. All industrial countries have a pressing economic need to reduce oil imports and they desire to meet their energy needs without undue reliance on the nuclear option, leaving them only one practical source of energy, the coal.

Now, the current market obviously occurs in countries that are energy deficient and whose own coal resources are either nonexistent or facing depletion and who have the capacity to switch to coal. This reduces the potential world market to Western Europe and the Far East.

There is a potential market in the developing Third World countries which are now almost wholly dependent on oil. These countries, however, lack the capital resources and technical ability to convert their oil facilities and build a coal import infrastructure. This in time will come. But at the present time it does not represent the market.

My purpose is to describe the rising demand for steam coal in the Far East in terms of quantity, quality, and price, and to review the U.S. competitive position and our prospects for serving this market.

Senator **Warner**. I see that you are reading from notes, which is perfectly acceptable. Do you have a statement, however, that you wish to be placed in the record?

Mr. **Smith**. I propose to take excerpts from this as I go through, Mr. Chairman, and then to submit my formal remarks later.

Senator **Warner**. That will be done. That is the format the Chair will follow with respect to each witness. Your entire statement will be made a part of the record of these hearings. The hearing record will remain open for at least a month, until February 1, within which time you can supplement the record.

However, the Chair is anxious to have you raise those points which you feel are most pertinent, so myself and my colleagues can have the benefit of those. Thank you.

Mr. **Smith**. In reviewing the Pacific rim, one quickly comes to the conclusion that the whole of the demand is in the Far East countries. Going around the South American countries, these countries are all self-sufficient in energy with the possible exception of Chile, which has a small import demand.

The countries in Southeast Asia are virtually self-sufficient, although Malaysia and Thailand may represent a small market in the future. So when we speak of the Pacific rim market, we are really speaking of the Far Eastern countries, which I will define in greater detail in a moment.

I would like to divide my remarks into three parts; demand, the quality-quantity and the nature of the customer; and, second, supply, the strengths and weaknesses of our competition; and, third, the U.S. competitive position and our prospects in this Far East market.

I propose prefacing this, however, with a few general remarks. I think it is important to recognize that this is a brand new market. It is neither an extension of the metallurgical coal trade, nor is it a renaissance of the old international coal trade, which was eliminated in the 1920's and 1930's by oil.

Today we have totally new importers, totally new sources of production and even new methods of consuming the coal itself. This new trade was virtually nonexistent 3 or 4 years ago. The second important feature is that this market unlike that of oil is relatively easy to forecast. Oil can be used in a great number of ways.

Steam coal, however, can only be burned in boilers. If there are no boilers, there is no demand. If you know where the boilers are or where they are being built or converted and when they will be completed, then you can calculate quite accurately the amount of coal which will be required.

This calls, therefore, for a microapproach to the forecasting procedure and all of our analyses and forecasts are based on preparing lists of generating plants in construction, planning, or conversion, showing their megawatt capacity and when they will be completed. And to this aggregation we add cement and other industry needs and determine year-by-year the coal requirement needs of each country.

A third feature of this trade is that the construction of burning facilities represents the longest lead item. It takes less time to develop a mine or a port or to build ships than it does to build a major powerplant.

Last, we should note that the coal market in the Far East differs somewhat from that in Europe. Europe was and to a large extent still is a coal-fired economy. Its return to coal is largely a reconversion to back out of oil. In the Far East, however, the industrial plant was and is essentially oil fired.

Adoption of coal, therefore, means building new facilities and these tend to be fewer in number, but much larger in size. Moreover, the countries in the Far East are still growing while the energy demand in Europe is relatively static. Now, looking at the Far East market there are only five or six countries in the entire Pacific region with an energy deficiency.

There is one major consumer, Japan, and two intermediate ones, Taiwan and Korea, and a few smaller ones, such as Hong Kong, the Philippines, and Singapore. These few countries, however, represent the fastest growing steam coal market in the world.

Attached to my written presentation is Zinder-Neris' most up-to-date forecast of demand for the next 10 years. From this you will see that Japan, which 4 years ago had an embargo on the import of steam coal, is now taking about 10 million tons and by the end of the decade this will increase by over 5 million tons.

Japan will soon overtake France as the world's largest steam coal importer. Taiwan and Korea go from zero imports to 15 and 11 million tons, respectively. This is a very large market quantitatively, but it is characterized mainly by rapid growth, which can only be described as phenomenal and certainly not duplicated elsewhere in the world.

So much for quantity. Now quality. All Far East customers have a declared policy of seeking supply security through diversity and to facilitate this they are designing all of their plants to accept the standard, general purpose steam coal. They are not building to accept the low-volatile coal, such as anthracite, nor the low-cost coal, subbituminous coal and lignites.

They might buy small quantities of these lower quantity coals for blending but certainly at the present time not as their base product. They are looking, therefore, for a standard steam coal with relatively low ash and with Btu values between 11,000 and 12,500. They are also seeking quality to meet environmental regulations.

In Japan these regulations are regional in nature and all regions have restrictions at least as stringent as those in the United States. They employ a fluke gas to sulfurization or scrubbers in virtually all of their plants, but they are still seeking a low-sulfur level in their imported coal.

Korea is a bit less restrictive in its regulatory levels and hope to solve their problems with coal quality and remote siting and their new plants are based on the sea coast and away from population centers. But nevertheless they are still seeking low-sulfur coal.

Taiwan is a bit less strict. Their island is small. Their new plants are on the sea coast and away from cities and currently they are burning a high-sulfur oil. They recognize, however, that sooner or later they are going to have to tighten their environmental levels and also will be seeking lower sulfur levels.

In the other countries, the regulations are mixed, but generally speaking they are looking for a low-sulfur coal.

The situation on quality for environmental reasons will determine the type and quality of coal we import but also there is a quality requirement to obtain operating efficiency and this is well understood in the metallurgical trade, particularly in Japan, where the scientific application of coal quality to their entire steel production system resulted in a reduction in the amount of coal needed to produce a ton of steel.

The same relationship exists in utility operations. A cheap coal can make a very expensive product. While an expensive coal may overall be cheaper. And it is the job of a utility to produce cheap electricity and not to buy cheap coal. In the future, therefore, we see quality levels becoming more and more important and steam coals being sold over a wider spectrum of price quality levels.

We feel this will require coal to be washed and while most of the coal moving in today's steam market is run of mine coal, in a relatively short time, we feel that wash coal will capture well over half of the steam coal market and in this the United States has an advantage.

Now a few words on the nature and size of the customers in the Far East. The Far East utilities are all large and well-administered corporations. The most significant characteristic of the Far East market and, in fact, of the steam coal market worldwide is the few numbers of buyers involved and their very large size.

In Japan there are two very large customers, Tokyo Electric and the EPDC, the latter being a government-controlled utility, which tackles difficult projects and sells power wholesale to the utility companies. In addition to these, there are three smaller utilities, but smaller here is a relative term. These companies will be contracting between 5 and 10 million tons each.

In Korea there is one utility; in Taiwan one; in Hong Kong two; in Singapore one. All in all then there are probably 10 individual buyers of, utility buyers of coal. And even in the industrial side, the buyers, they tend to be very large concerns.

The picture in the Far East facing the coal producer therefore is somewhat intimidating: very large experienced, intelligent, powerful buyers operating in a buyer's market and in a position to be very demanding in terms of price and quality.

So much for the demand side, now supply. There are four coal exporting countries in a position to compete with us in serving the Far East market, Australia, Canada, China, and South Africa. Each of these countries has strengths and weaknesses, advantages and disadvantages, which must be understood in assessing the U.S. competitive position.

Australia is by far the strongest and toughest competitor in the Far East. Australia has extensive reserves of easily mined, good quality coal, generally situated close to modern, well-developed ports. Its mining industry is well-structured and consists of a few very large companies capable of generating their own capital of developing mines and of marketing abroad.

Their principal countries depend almost solely on the export market and therefore are extremely experienced in international marketing and coal movement. On the other hand the Australian coal industry suffers from government interference in the commercial process, government control of inland transportation and infrastructure, a militant and strike-prone labor force, and deficiencies in technical management.

Canada is currently a small but rapidly expanding producer. It has good coal in the hands of large powerful companies. It has good railroads with modest freight rates and excellent export facilities capable of serving very large ships.

The mining industry and the export intrastructure, however, require extensive development, but it is receiving good government support and the financial help of its customers. China is and will continue to be riddle-racked and an enigma. It is one of the world's top three coal producers, but its mines range from primitive to highly sophisticated. They are all government owned and operated.

China's biggest disadvantage is a weak and badly organized and ill-equipped rail system. It also has a rising demand for coal and a virtual absence of an export infrastructure. It also lacks a technical and commercial middle management and a system of government, which does not inspire long-term confidence.

Some authorities project large export tonnages from China, but we disagree. We feel that their coal based economy will absorb virtually all of China's coal production and that they will seek an export market with their new found oil.

China is seeking and obtaining technical aid and equipment from Japan and undoubtedly some coal will be exported as a consequence of this. But in our view, China will not be a large or dominant competitor in the Far East.

South Africa was an early supplier to the Far East. In fact, the first ever exports from South Africa want to Japan just a few years ago. South Africa we feel, however, will not be a big supplier to the Far East countries for a variety of reasons.

South Africa's exports are limited severely by the government. With the rising cost of ship fuel, South Africa is at a disadvantage in serving distant markets. South Africa's coal is not particularly good in quality, it being high in ash.

Most important, however, is that South African coal is no longer cheap. The South African countries, particularly Shell, have been buying into the market, but now they are basing their pricing policy strictly on world price levels.

An important characteristic of these supplying countries, however, is the few number of very large producers who are offering coal. Australia has about six companies and they are big, experienced, and very capable. Canada has about five; China one; South Africa only six sellers.

These large, experienced coal sellers then face large powerful buyers, who I outlined earlier. It is, therefore, a fair to equal contest in which both parties operate and most important depend for their survival entirely on the international market. The tough customers operating in a buyer's market face equally tough producers operating in wide-open competition.

Now, analyzing the U.S. position in this developing but tough competitive market, how will we fair in this new marketplace? There are some realities we must take into consideration on which the chairman has already mentioned. Our current exporting base the Appalachian coalfields and Eastern coal ports are at a great disadvantage in serving this Far East market.

To be competitive in the steam coal trade, we have to use large shipments, ideally about double the size currently shipping eastern coal. Ships of this size, however, cannot get into our east coast ports and even if they could, they cannot pass through the Panama Canal. It follows, therefore, that to serve this Far East market we must depend largely on our western coal assets. Hereto we face problems.

First, we do not have the export intrastructure in place and, second, our most abundant western sources, the Wyoming and Montana, produce a coal which the foreign market does not really want. However, this still leaves plenty of coal suitable for export on the western slopes, principally in central and southern Utah.

To develop the mines in this area, however, we need a strong base of domestic demand, which because of various factors seems long in developing. It would be very difficult, if not impossible, to establish a firm supply base on just the export trades.

We need the domestic demand in order to make our exports competitive. There is a strong demand for our coal in the Far East then and they definitely need our coal. But what share might we get? The share which the United States will capture of this market depends absolutely on the degree and manner in which the United States attacks it.

This market like any other must be captured from competitors. If we wait for the market to come to us, our share is going to be very small. We are going to get a small share by default. As I mentioned, all of the countries wish to diversify their purchases and they cannot afford to overlook the United States. This will get us some coal.

But to get a proper share, we are going to have to fight for it. In this fight, we have problems and these problems are largely of our own making. As mentioned, we have problems in inland transportation and export intrastructure and these problems, long predicted and now obvious to all, are finding solutions, but finding these solutions on the west coast will not be easy.

We have problems in developing the potential of our Western coal assets in the face of Federal leasing policies, constraints of regulatory procedures, and the objections of nautical environmental activists and other institutional barriers. Fortunately, the current administration appears to be attacking these problems with vigor.

Last, we have the problem of our own motivation which is possibly the most serious problem facing us. Our competitors are hungry and they have got to be. Their own domestic markets are small, such as Australia and Canada, or unprofitable, as in the case of South Africa. With these countries, it is a question of export or die.

With us the export market is bonus. It is not a question of survival. The U.S. coal industry then faces these relatively experienced buyers in competition with a few big, tough, foreign sellers. But our industry is fractured. It consists of a few experienced metallurgical coal exporters on the east coast, a number of large powerful steam coal producers who have never exported a pound of coal overseas, internationally experienced oil companies, who have got a great deal to learn about coal, and then hundreds of small mining companies, few of which have the competence or resources to sell abroad.

And somehow we must take this industry, which is structured to serve the largest domestic market in the world and turn at least a part of it around, so it can take advantage of this developing world market. To do this we will have to sharpen our marketing skills and broaden our perception of the market and of the difficulties facing us.

The challenge here is one for the coal industry, which with some distinguished exceptions, has yet to mobilize its full efforts. The Government certainly can support, but in our view, this support shall be aimed at freeing the industry and removing the few remaining blocks to free the production and movement of coal.

And in this, any blocks that can be removed on the movement of coal would be of greatest importance. That concludes my remarks.

[The prepared statement of Mr. Smith follows:]

STATEMENT OF N. G. WILSON-SMITH, PRESIDENT, ZINDER-NERIS, INC.

THE FAR EAST MARKETS FOR U.S. COAL

INTRODUCTION

Mr. Chairman, members of the committee, ladies and gentlemen. I wish to thank the sub-committee for inviting me to present our impressions and forecasts of the Far East coal export market.

Up to recently, our coal exports to the Far East were almost exclusively metallurgical coal to fuel the steel industry. This market continues to exist, but its demand is flat, and also we have lost a great deal of the Far East market to Australia and Canada. For this reason I shall limit my remarks to the rising steam coal trade where all the dynamism is.

The reasons for the booming new international market in steam coal are now well understood. All industrial countries have:

a. A pressing economic necessity to reduce oil imports, and

b. The desire to meet their energy needs without undue reliance on the nuclear option.

This leaves only one practical source of energy--coal.

The current market obviously occurs in countries which are energy deficient, whose own coal resources are either non-existent or facing depletion, and who have the capability to switch to coal. This reduces the potential world market to Western Europe and the Far East. (There is a potential market in the developing Third World countries which are now almost wholly dependent on oil. These countries, however, lack the capital resources to convert their oil-fired facilities and build a coal import infrastructure).

PURPOSE

My purpose is to describe the rising demand for steam coal in the Pacific Rim in terms of quantity, quality, and price, and to review the US competitive position and our prospects for serving this new market.

STATEMENT OF CAPABILITIES

First, however, I would like to state our qualifications for making such an assessment.

Zinder-Neris is a coal consulting company jointly owned by Neris International, Inc. of New York which for 30 years has exported US coal to Europe, the Far East, and other areas, and by Zinder Companies, a Washington-based energy consulting company which for the same length of time has served the US natural gas, pipeline, and utility industries. It is this blend of active commercial experience in exporting coal and professional consulting skills which gives us our capability. Zinder-Neris has been studying the rising international demand for steam coal for the past four years. We visit virtually every country in Europe and all of the importing countries in the Far East to improve and update our information. We have skilled correspondents in all of these countries, developed through Neris's exporting operations. We have prepared a 350 page world steam coal supply/demand analysis and forecast which we update quarterly: our World Steam Coal Service. This report, and our continuing investigations and review provide the data base for my remarks. We also participated in the Interagency Coal Export Task Force wherein we provided inputs on the Far East, Poland, and South Africa.

GENERAL

I shall divide my remarks into three parts:

a. Demand - quantity, quality, and the nature of the customer.
b. Supply - strengths and weaknesses of our competition.
c. The US competitive position and our prospects in the Far East market.

First, I would like to make a few general remarks concerning this new world trade.

It is important to recognize that this is a brand new trade. It is neither an extension of the metallurgical coal trade, which up to recently accounted for almost all of the cross-ocean movement of coal, nor is it a renaissance of the old international coal trade, which was eliminated in the 1920's and '30's by oil. Today, we have totally new importers, totally new sources of production, and even new methods of consuming the coal itself. This new trade was virtually non-existant four years ago.

A second important feature is that this market, unlike that of oil, is relatively easy to forecast. Oil can be used in a great number of ways. Steam coal can only be burned in boilers. If there are no boilers, there is no demand. If you know where the boilers are, or where they are being built or converted, and when they are to be completed, you then can calculate quite accurately the amount of coal which will be required. This requires a micro approach to the forecasting procedure, and all our analyses and forecasts are based on preparing lists of generating plants in construction, planning or conversion, showing their megawatt capacity, and so their coal requirement, and when they will be completed. To this aggregation we add cement and other industry needs and determine, year by year, total coal requirements by country.

A third feature of this new trade is that the construction of the burning facilities represents the longest lead item. It takes less time to develop a mine, a port, or to build ships, than it does to build a major power plant. Lastly, we should note that the coal market in the

Far East differs somewhat from that in Europe. Europe was, and to a large extent still is, a coal-fired economy. Its return to coal is largely a re-conversion, to back out of oil. In the Far East however, its industrial plant is largely oil-fired, and moreover the energy needs of the industrialized countries in the Far East are still expanding. Adaptation of coal in these countries therefore requires more building of new facilities than conversion of present ones. These new facilities tend to be larger in size and fewer in number.

QUANTITY

Let us now look at the Pacific Rim in a little greater detail. In reviewing the countries on the Pacific Rim, it is soon apparent that most are self-sufficient in energy - Canada, the US, Mexico, all of South America, with the exception of Chile which has a very small requirement, Australia and China, and Southeast Asia with its plentiful oil and lignite. There are only five or six countries in the entire Pacific region with an energy deficiency; one major consumer, Japan; two intermediate ones, Taiwan and Korea; and a few smaller ones such as Hong Kong, the Phillipines, and Singapore. These few countries however, represent the fastest growing steam market in the world.

Attached at Appendix A is Zinder-Neris' most up-to-date forecast of demand for the next ten years.

From this you will see Japan, which four years ago had an embargo on the import of steam coal, is now taking about 10 million tons and by the end of the decade this will increase by over five times. Japan will soon overtake France as the world's largest steam coal importer. Taiwan and Korea go from nothing to 15 and 11 million tons, respectively. This is a large market quantitatively, but it is characterized by its rapid growth which is phenominal and not duplicated elsewhere.

QUALITY

All Far East consumers have a declared policy of seeking supply security through having a number of different sources for coal. To facilitate this they are all designing their plants to accept a standard general-purpose steam coal. They are not building special plants to accept low volatile coal such as anthracite, nor low calorie sub-bituminous coals or lignites. They might buy small quantities of these lower quality coals for blending, but not as their base product. They are looking, therefore, for a standard steam coal with relatively low ash, and BTU values between 11,000 and 12,500.

Environmental restrictions exist in all countries, but they vary widely:

a. Japan's regulations are regional in nature with all regions having restrictions at least as strict as the US. Flue gas desulphurization is planned in virtually all plants but, still, they are seeking low sulphur levels in imported steam coals.

b. Korea has less strict regulatory levels and hopes to solve their problems with coal quality and remote siting: their new plants are on the seacost away from population centers.

c. Taiwan is even less strict. Their island is small, and new plants are on the seacoast away from cities; currently they are burning a reasonably high sulphur oil. They recognize that sooner or later they will have to tighten up their environmental levels, but for the present they will accept coals with sulphur levels up to 2%, provided the price is right.

d. The Hong Kong regulations are mixed. The Lamma Island plant of Hong Kong Electric has favorable wind conditions and they may use higher sulphur levels. The Castle Point plant of China Light and Power, however, is on the mainland and will have more environmental problems.

e. Singapore is extremely sensitive to their environment. In fact this has led to a postponement of two years in their conversion to coal, delaying coal's introduction to the late 1980's.

It can be seen therefore that all countries seek high quality, low sulphur coals to protect their environment.

That is the situation on quality for environmental reasons. There is also a quality requirement to obtain operating efficiency. The relationship of price and quality is well understood in the metallurgical trade, particularly in Japan where the scientific application of coal quality to the entire steel production system resulted in a reduction in the amount of coal used to produce a ton of steel. The same relationship exists in utility operations. A cheap coal can make very expensive product, while an expensive coal may overall be cheap. The job of a utility is to produce cheap electricity, not buy cheap coal.

Three principal factors determine the cost of electricity produced:

a. The heat rate -- that is the efficiency with which the inherent heating value of the fuel is usefully employed.

b. The plant factor -- that is the percentage of the capacity of the plant that is actually used annually, and

c. The cost of buying fuel and of handling its undesireable byproducts, such as ash and sulphur.

Time does not permit going into the technical details of this price quality equation, except to say that to achieve a high heat rate, the coal used must be of a consistent quality. To achieve a high plant factor, it is necessary to keep the plant operating without unscheduled outages, the principal cause of which is excess slagging in the interior of the boiler; this can be avoided by careful selection of coals with low ash levels and favorable ash chemistry. Operating costs can be reduced by paying careful attention to ash levels; ash removal in the high population densities in the Far East is a very serious problem, where costs can easily double those of the US. A high ash coal, moreover, represents dead freight and when this is applied to long ocean hauls and many intermodal transfers, a few percentage points of ash become very important dollars.

When this relationship between price and dollars is better understood, the demand for specific qualities of coal will start to emerge. Coal will no longer be priced just on its heating value, but on a complex aggregation of the other factors of consistent quality: moisture, and the amount and nature of ash. The Japanese, who led the way in exploring the technical characteristics of coal and relating these to economics, can be expected to apply the same technical genius once they become more used to operating coal fired boilers.

In the future, therefore, we see quality levels becoming more and more important and steam coals being sold over a wide spectrum of price/quality levels. This will require coal to be washed while most of the coal moving today is raw run-of-mine coal. In a relatively short time, we feel that washed steam coal will capture well over half the steam coal market. This is an advantage to the US.

DEMAND - SIZE OF CUSTOMERS

Now a few words on the nature and size of the customers in the Far East.

The Far East utilities are all large and well administered corporations. The most significant characteristic of the Far East market, in fact of the steam market world wide, is the few number of buyers involved and their very large size. In Japan there are two very large customers, Tokyo Electric, and the EPDC, the government controlled utility which tackles difficult projects and sells power wholesale to the private utilities. In addition to these two, there are three smaller utilities, but smaller is a relative term-these companies will be contracting between 5 to 10 million tons per year each. In Korea there is one utility, in Taiwan one, in Hong Kong two, and in Singapore one. All in all then, there are ten individual buyers for all the coal to be consumed in the Far East.

To further aggravate the situation, the Japanese utilities have formed JCDC, The Japan Coal Development Corporation, a purchasing collective which will buy centrally up to 50% of Japanese requirements.

Commercial procedures will also differ from the current metallurgical trade. In the Far East there is tradition, particularly in Japan, of exports and imports being handled by trading companies. The trading companies are important in the metallurgical coal business and all coal going to Japan is in some way bought, controlled or managed by a trading company. The principal reason for this is the trading company's importance in obtaining markets for the products of the steel company. They act, therefore, as both importers and exporters.

However, they are less important to the utilities, who have no product to be exported. The trading companies will tend to act more as agents or advisers to the utilities. They are still important, but their importance will decline as the utilities become more experienced. Unlike the metallurgical coal business, they will not be the contracting party; all the utilities seek to contract direct with the producer.

The picture in the Far East facing the coal producers, therefore, is an intimidating one. Very large, experienced, intelligent, powerful buyers operating in a buyer's market and in a position to be very demanding in terms of price and quality.

So much for the demand side of the supply/demand balance, now supply.

SUPPLY

There are four coal exporting countries in a position to compete with the US in serving the Far East market.

Australia
Canada
China
South Africa

Each of these countries has strengths and weaknesses, advantages and disadvantages which must be understood in assessing the US competitive position.

Australia is the strongest and the toughest competitor in the Far East. Australia has extensive reserves of easily-mined good quality coal, generally situated close to modern, well developed ports. Its mining industry is well structured and consists of a few very large companies capable of generating their own capital, developing mines, and marketing abroad. The principal companies depend almost solely on the export market, and therefore, are extremely experienced in international marketing and coal movements. On the other hand the Australian coal industry suffers from government interference in the commercial prices, government control of inland transport and infrastructure, a militant and strike-prone labor force, and a deficiency of technical management.

Canada is currently a small but rapidly expanding producer. It has good coal in the hands of large powerful and experienced companies. It has good railroads with modest freight rates and excellent export facilities capable of serving very large ships. Canada's mining industry requires extensive development, however, but it is receiving good government support and the financial help of its customers.

China is, and will undoubtedly continue to be "a riddle wrapped in an enigma". It is one of the world's top three producers, but its mines vary from primitive to highly sophisticated; they are all government-owned and operated. China's biggest disadvantages are a weak and badly organized and equipped rail system, a rising domestic demand for coal, a virtual absence of an export infrastructure, a lack of technical and commercial middle management, and a system of government which does not inspire long-term confidence. Some authorities project large export tonnages from China, but we disagree. We feel their coal-based economy will absorb China's coal production and that they will seek an export market with their new-found oil, which is more easily sold and transported. China is seeking and obtaining technical aid and equipment from Japan. Undoubtedly some coal will be exported as a consequence of this, but in our view China will not be a large or dominant competitor in the Far East.

South Africa was an early supplier to the Far East. In fact, South Africa's first-ever exports went to Japan just a few years ago. South Africa we feel, however, will not be a big supplier to the Far East countries, for a variety of reasons:

a. South Africa's exports are strictly limited in quantity by the government.

b. With rising costs of ship's fuel, South Africa is at a disadvantage in serving distant markets.

c. South African coal is high in ash, as much as 17%, and this will discourage buyers.

d. Most important, however, is the fact that South African coal is no longer cheap. Most South African companies, particularly Shell, have been "buying into" the market, but now they are basing their pricing policies strictly on world price levels.

An important characteristic of these supplying countries is the few number of very large producers who are offering coal.

a. Australia has about six companies, and these are big, experienced, and very capable.

b. Canada has five, of which two are important.

c. China has one, the government.

d. South Africa has only six sellers.

These large experienced coal sellers, then, face the large powerful buyers I outlined earlier. It is, therefor, a fairly equal contest in which both parties operate and depend for their survival entirely on the international market. The tough consumers operating in a buyer's market face equally tough producers operating in wide open competition.

Now let us analyze the US position in this developing, but tough competitive market. How will we fare in this new market place?

There are some realities we must take into consideration:

Our current exporting base - Appalachian coal fields and the Eastern coal ports - are at a grave disadvantage in serving their Far East market. To be competitive in the steam coal trade, we must use large ships, ideally double the size currently shipping Eastern coal. Ships of this size however can't get into our ports. Nor can they pass through the Panama Canal.

It follows therefore, that to secure this Far East market we must depend largely on Western coal. Here too we face problems. First we do not have an export infrastructure in place, and second, our most abundant Western sources, Wyoming and Montana, produce a coal which the foreign market currently does not want. However this still leaves plenty of coal suitable for export on the Western slopes principally in central and southern Utah.

To develop the mines in this area however, we need a strong base of domestic demand which, because of various factors, seems long in developing. It would be very difficult, if not impossible, to establish a firm supply base on just the export trade. We need domestic demand to make competitive exports possible.

There is a strong demand for coal in the Far East, and they need our coal. What share of this demand might we get?

The share the US will capture of this new market depends absolutely on the degree and manner in which the US attacks it. This market, like any other, must be captured from competitors. If we wait for the market to come to us, our share will be very small. We will get a small share by default; all the countries wish to diversify their purchases and they cannot afford to overlook the US. This will get us some coal, but to get a proper share we must fight for it. We have problems however, but they are largely of our own making:

a. We have problems in inland transportation and export infrastructure.

These problems, long predicted, are now obvious to all, but finding solutions, particularly on the West Coast, will not be easy.

b. We have problems in developing the potential of our western coal assets in the face of federal leasing policies, constraints of regulatory procedures, the objections of fanatical environmental activists, and other institutional barriers. Fortunately, the current administration appears to be attacking these problems with vigor.

c. Lastly, we have the problem of our own motivation, and this is probably the most serious problem facing us. Our competitors are hungry; they have got to be. Their own domestic markets are small, such as in Australia and Canada, or unprofitable, as in South Africa. With these countries it is a question of export or die. With us the export market is a bonus. It is not a question of survival.

The US coal industry faces relatively few experienced buyers while in competition with a few big tough foreign sellers. The US industry is fractured, consisting of (a) a few experienced metallurgical coal exporters on the East Coast, (b) a large number of large powerful steam coal producers who to date have never sold a pound of coal overseas, (c) internationally experienced oil companies who nevertheless have got a great deal to learn about coal, and (d) hundreds of small mining companies, few of which have the competence or resources to sell abroad.

Somehow we must take this industry, which is structured to serve the largest domestic market in the world, and turn at least a part of it around so it can take advantage of this developing world market. To do this we will have to sharpen our marketing skills and broaden our perception of this market and of the difficulties facing us. The challenge here is for the coal industry which, with some distinquished exceptions, has yet to mobilize its full efforts. The government can support. In our view however, this support should be aimed at freeing the industry and removing the few remaining blocks to the free production and movement of coal. Particular attention should be given to the movement of coal from mine to ship's hold. Economies achieved in this area would do much to increase the competitive attractiveness of US coal.

APPENDIX A

To Senate Testimony

SUMMARY OF DEMAND

The following tables summarize Zinder-Neris' steam coal import forecasts as of 30 Sep 81. Note that these figures do not include indigenous coal nor metallurgical coal, just steam coal imports. These tables are excerpted from Zinder-Neris' World Steam Coal Service, a constantly updated analysis of the international market of steam coal.

WORLD (MILLIONS OF METRIC TONS)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Europe	51.4	59.8	71.7	83.1	99.6	106.6	118.1	129.1	141.6	158.0
Far East	9.6	18.2	27.9	34.6	41.4	49.0	56.4	70.1	83.2	95.2
TOTAL	61.0	78.0	99.6	117.7	141.0	155.6	174.5	199.2	224.8	253.2

FAR EAST (MILLIONS OF METRIC TONS)

COUNTRY	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Japan	9.1	13.6	17.5	20.7	24.7	29.7	31.5	38.0	47.0	55.2
Taiwan	-	.6	1.9	2.7	3.9	6.0	10.0	12.2	13.8	15.8
Korea	.5	2.7	5.9	7.3	8.1	8.1	8.5	9.7	10.6	11.8
Hong Kong	-	1.3	2.6	3.9	4.7	5.2	6.4	8.2	8.2	8.8
Singapore	-	-	-	-	-	-	-	-	1.6	1.6
Others	-	-	-	-	-	-	-	2.0	2.0	2.0
TOTALS	9.6	18.2	27.9	34.6	41.4	49.0	56.4	70.1	83.2	95.2

EUROPE (MILLIONS OF METRIC TONS)

COUNTRY	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Belgium	4.5	5.0	6.0	6.0	6.0	6.5	7.0	8.0	9.0	10.0
Denmark	9.6	10.0	11.0	12.0	13.0	14.0	15.0	15.5	16.0	16.0
France	16.0	16.5	18.0	19.5	22.0	22.0	24.0	25.0	25.0	28.0
Germany(FRG)	7.8	9.0	12.0	16.0	19.0	19.0	21.0	23.0	25.0	28.0
Italy	5.8	7.0	7.5	8.5	11.0	13.0	16.0	20.0	25.0	30.0
Netherlands	2.9	3.3	4.2	4.6	5.6	6.1	6.1	6.6	7.6	8.0
Spain	3.3	6.0	8.5	10.5	15.0	17.0	18.0	19.0	21.0	22.0
Sweden	0.5	1.5	3.0	4.5	5.0	6.0	7.0	8.0	8.0	10.0
Others	1.0	1.5	1.5	1.5	3.0	3.0	4.0	4.0	5.0	6.0
TOTAL	51.4	59.8	71.7	83.1	99.6	106.6	118.1	129.1	141.6	157.0

Senator WARNER. These were very helpful observations. I had a great deal of contact with the local coal producers. That is to say that most of them in Virginia. But I think they reflect a good deal of the thinking on the east coast producers. This question was propounded to me time and time again—"Would you explain the importance that trading companies play in the Pacific rim markets?"

Mr. SMITH. The import procedures for every country in the world vary and there is no way you can generalize. In taking the countries in turn, in Japan at the present time, the trading companies are a very important element in the import of coal.

The reason for this is that the steel companies are and have been the major customers and they have in turn a product to sell and the trading companies are selling their product abroad. As the trading companies then classically and for the past 20 or 30 years have been selling steel abroad, it is easier for them to buy the coal than to import it.

When you transfer this to the steam coal trade, however, the utilities do not have a product to sell abroad and I think your question is one that could be asked of the representative from Pensi Electric. But our impression is that the utilities themselves wish to take a stronger stand and to be the buyer and to rely, not so much on the trading companies, but on their own internal marketing skills, but for a period of time they will seek the advice of the trading companies.

Now, the degree to which the trading company is going to be able to find a place in this steam coal trade is, I would say, has not yet been thoroughly established, but I think it is fair to say that the role of the trading company is going to be a diminished one in comparison with the metallurgical trade.

And with our discussions with the trading companies, they tend to recognize this. Where they have before been a principal buying the coal, transporting it and reselling it to the steel company in the future it is possible that they could become more of an importing agent acting on behalf of and doing certain of the functions but not in the strong position they had in the met trade.

In Taiwan this is a government-owned utility, government-owned steel companies and they have tended to deal direct without the aid of trading companies. The same applies to Korea. Although some coal does move into Thailand and into Korea through trading companies, it is a very small proportion.

Similarly in the utilities of Hong Kong and Singapore they propose to deal direct with consumers.

Senator WARNER. I want to ask if you are able to hear in the back or do we have to readjust the microphones? One of our staff is back there.

Another question, what are the basic differences in the marketing of coal in the Pacific rim countries and that of European countries? Perhaps we have covered that, but maybe you want to elaborate.

Mr. SMITH. I think it is mostly differences in size of the customers and size of the shipments. The cultural differences do not mean a great deal in the coal trade. It tends to work as a rather small club where friendships are made that are as equally close in the various countries.

Certainly, once a company establishes itself and gains the confidence of customers in the Far East, they can work just as smoothly and just as easily and in some cases more easily than they do in Europe. In Europe there is a greater diversity in the commercial approach and in their mores, but in the Far East we find it is an excellent place for Americans to do business and it does require, however, knowledge and understanding and a sympathetic approach that nobody can be taught. It is just something that has to be absorbed.

Senator **Warner**. Thank you. At this time I must open the second series of hearing and I am going to turn over the Chair to my colleague. But I am also chairman of the nuclear forces subcommittee. We are anxious to hear the report on the Geneva talks. But I will be back as rapidly as I can.

Senator Murkowski, I thank you for stepping in for me.

STATEMENT OF HON. FRANK H. MURKOWSKI, A U.S. SENATOR FROM THE STATE OF ALASKA

Senator **Murkowski** [presiding]. Thank you very much, Senator Warner. I see here you have given me a good pile of reading material and I want to get down to it. Mr. Smith, if you would bear with me until we get a little organized here, we will proceed with some questions.

I understand that as president of Zinder-Neris, Inc., you are world renowned in your knowledge of coal and in the future of coal as we are seeing it expand, particularly in the rim countries, as they move over from crude oil to steam coal.

I would like to take this opportunity to commend our chairman, Senator Warner, for conducting this series of oversight hearings on America's role in the world coal market. We are all aware that dramatic increases in the price of oil over the past decade are forcing a broad reassessment of the use of coal as a low-cost alternative fuel.

We are also well aware of the tremendous coal resource base that exists in our Nation. This morning we will be exploring some of the problems that we shall face in bringing these vast U.S. resources to market in the energy-short Pacific rim nations.

Canada, South Africa, Australia, and several other nations are positioning themselves to help meet the growing demand for coal in the Pacific rim area. And I believe that it is important for our Nation to make the same preparations, and I believe these hearings will prove to be a step in the right direction.

The Pacific rim coal market is particularly important to me and my own State of Alaska. Alaska has a tremendous resource of coal. While the State's proven reserves are an estimated 1.4 billion tons, Alaska has a hypothetical coal base of 1.7 trillion tons. As coal exploration proceeds in the State of Alaska, the proven reserve base will increase accordingly.

Additionally, much of Alaska's coal is located near tidewater and preliminary exploration and testing has revealed that much of this coal is of the grade and quality sought by the Pacific rim nations. Last December an Alaskan coal company sent a 33,000 ton test shipment to Korea. That same company, the Usibelli Coal Mine, Inc., has recently signed a 10-year contract with a Korean shipping company.

A joint venture has recently been entered into between the Anchorage based Chugach Native Corp. and a Korean consortium in order to explore coal deposits on Federal lands. Clearly, these developments underscore the fact that Alaska too provides a significant amount of coal to Pacific rim markets. Admittedly, a number of obstacles must be overcome before Alaskan coal, and coal from the lower 48, will be able to compete more effectively in Pacific rim markets.

There may be unnecessary regulatory constraints which hinder responsible coal resource development. We may have to work to promote the partnership between private industry and Federal, State and local government that is necessary to develop the transportation infrastructure that must be in place if American coal is to compete effectively in world markets.

I know that Senator Warner has introduced legislation, which I have cosponsored, that will take the first important steps toward the maintenance and improvement of the Nation's deep draft commercial ports in order to accommodate increasing import and export trade.

These are but a few of the steps that we must take and I am anxious to learn more of the other difficulties that we will face if we are to put our own domestic energy resources to work for us, both here and abroad.

I would ask, Mr. Chairman, that a copy of a report on Alaska's coal resources appear in the hearing following my remarks.

Thank you.

[The report "Alaska Coal Resources" follows:]

State of Alaska
Department of Natural Resources
DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

Jay S. Hammond, Governor
Robert E. LeResche, Commissioner
Ross G. Schaff, State Geologist

April, 1979

ALASKA COAL RESOURCES

By D.L. McGee and K.S. Emmel

3001 Porcupine Drive
Anchorage, Alaska 99501
277-6615

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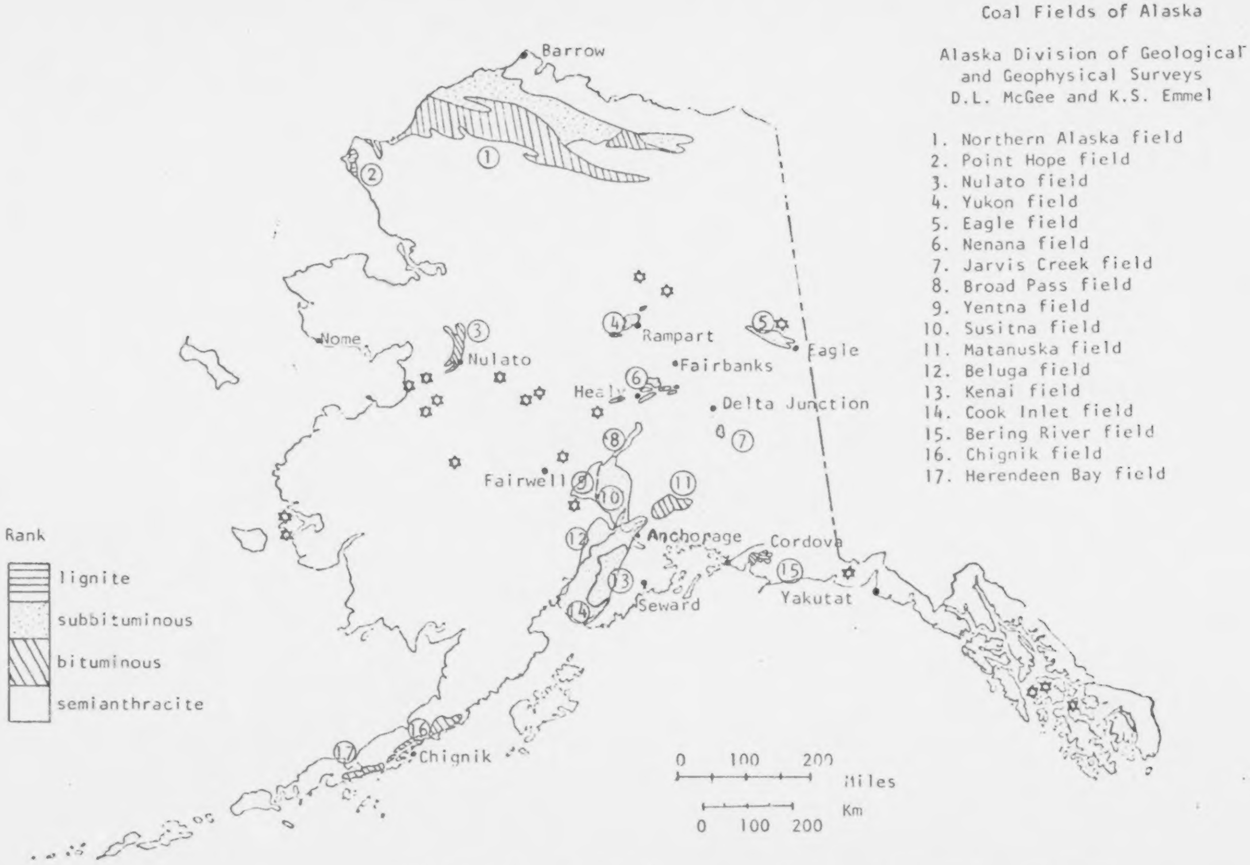
INTRODUCTION

The estimated coal resources of Alaska are very difficult to ascertain because of the lack of data control beyond outcrop areas and drilled areas adjacent to outcrop areas. However, as in this report, it sometimes becomes necessary to compare resource values from other areas with those in the state of Alaska. A comparison of total coal resources between Alaska and the United States involves figures generated with minimum data from Alaska and a large data base from coal areas in the United States. A total resource value for the contiguous United States is a more accurate figure than could possibility be made for Alaska because of the increased amount of data that is available in the United States. For this reason it may not be valid to make comparisons between the resources of the two areas.

In many areas in Alaska there is a wide range in the undiscovered resource estimates which reflects the scarcity and ambiguity of the available data. The main purpose of this summary is to condense the data into single values that can be used for comparison purposes and yet at the same time be aware of the hazards of comparing the values.

The coal resources have been broken into three simple catagories. Measured Resources are those resources that have a high probability of being accurate. Indicated and Inferred Resources are somewhat similar and have been grouped into one catagory in this summary. The two represent the resources in a zone of decreasing accuracy between measured and hypothetical resources. Hypothetical Resources, as the name implies, are those resources for which there is a wide range of possible error.

The parameters which control the resource values are those proposed by the United States Geological Survey and the Bureau of Mines. The economics of extracting the coal and the percent recovery expected do not enter into this resource summary.



Coal Fields of Alaska

Alaska Division of Geological
and Geophysical Surveys
D.L. McGee and K.S. Emmel

1. Northern Alaska field
2. Point Hope field
3. Nulato field
4. Yukon field
5. Eagle field
6. Nenana field
7. Jarvis Creek field
8. Broad Pass field
9. Yentna field
10. Susitna field
11. Matanuska field
12. Beluga field
13. Kenai field
14. Cook Inlet field
15. Bering River field
16. Chignik field
17. Herendeen Bay field

Map compiled from Conwell, C.N., 1977, Energy Resource map of Alaska,
Alaska Department of Natural Resources, DGGS.

Figure 1

ALASKA'S COAL RESOURCES

COAL FIELD	MEASURED RESOURCES	INDICATED & INFERRED RESOURCES	HYPOTHETICAL RESOURCES	DATA SOURCES AND REMARKS
Northern Alaska NPR-A	200 million stripping coal	49-120 billion short tons	330 billion to 3.3 trillion short tons	Barnes, 1967 Martin , 1978 McGee, 1975
	200 million	85 billion	1.5 trillion	values used in charts
Nc Alaska West of NPR-A	35 million	7-12 billion	153 billion includes 3 billion tons within three mile zone along coast	Callahan, 1975 Barnes, 1967 McGee, 1975
	35 million	9 billion	153 billion	values used in charts
Northern Alaska East of NPR-A	--	2-5 billion	50 billion	Barnes, 1967 McGee, 1975
	--	3.5 billion	50 billion	values used in charts
Nenana Coal Field	861.6 million	6.0 billion	8.7 billion	Barnes, 1967 Holloway, 1977 McGee, 1975
Jarvis Creek Coal Field	--	13-76 million	--	Barnes, 1967 Holloway, 1977
	--	44 million	--	values used in charts

Figure 2

COAL FIELD	MEASURED	INDICATED & INFERRED RESOURCES	HYPOTHETICAL RESOURCES	DATA SOURCES AND REMARKS
Susitna Coal field	275 million	2.7 to 10.2 billion	27 billion	Barnes, 1967 Holloway, 1977 McGee, 1975 Placer Amex Inc., 1977
*	275 million	6.5 billion	27 billion	values used in charts
Matanuska Coal Field	6.6 million	108-130 million	149 million	Barnes, 1967 Holloway, 1977 McGee, 1975
	6.6 million	112 million	149 million	values used in charts
Kenai Coal Field Onshore	0.2 million	318 million	34 billion	Barnes, 1967 Holloway, 1977 Magoon, 1976 McGee, 1975
Kenai Coal Field Offshore	--	--	100 billion	McGee, 1974 values not used in totals
Broad Pass Coal Field	--	64 million	--	Hopkins, 1951 Barnes, 1967 Holloway, 1975
Chignik Bay Coal Field	--	100 million	300 million	McGee, 1977 unpublished field notes Cretaceous coal only
Herendeen Bay Coal Field	--	10-100 million	Less than 300 million	McGee, 1977 unpublished field notes Cretaceous coal only
	—	45 million	300 million	values used in charts
Bering Glacier Coal Field	--	--	36 million to 1 billion	Barnes, 1951 Saunders, 1976
	--	--	500 million	values used in charts

* The Beluga coal field is a part of the Susitna coal province. The 275 million short tons of measured coal and 2.3 billion short tons of indicated and inferred coal represent the Beluga resources.

Figure 2 (cont'd)

COAL FIELD	MEASURED RESOURCES	INDICATED & INFERRED RESOURCES	HYPOTHETICAL RESOURCES	DATA SOURCES AND REMARKS
Isolated Coal Occurences	Listed below are the more important isolated occurences of coal in Alaska. There are numerous other areas where thin coals crop out.			
Eagle Circle	--	--	10-100 million	
	--	--	45 million	values used in charts
Nation River	--	--	1-50 million	
	--	--	25 million	values used in charts
Yukon River	--	--	10-50 million	Chapman, 1963 Collier, 1903
	--	--	30 million	values used in charts
Little Tonsina River	--	--	--	Coal outcrop thicknesses suggest large resources Sloan, et al, 1979
Unga Island	--	--	Probably minor	Holloway, 1977
Tertiary Coal Alaska Peninsula	--	--	Probably large	McGee, 1977 Unpublished
Southeast Alaska	--	--	Unknown probably small	Wright, 1906

Figure 2 (cont'd)

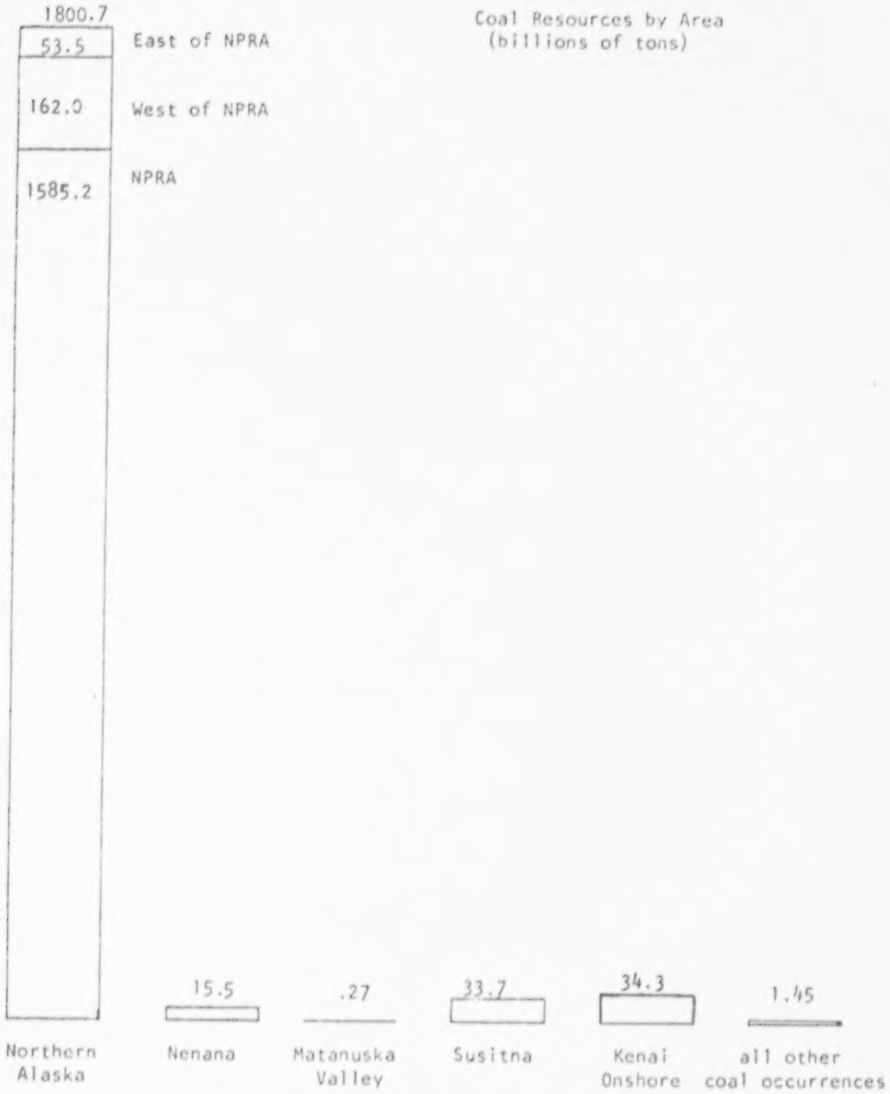
ALASKA COAL RESOURCES -- SUMMARY

COAL FIELD	MEASURED RESOURCES	INDICATED & INFERRED RESOURCES	HYPOTHETICAL RESOURCES	REMARKS
All of Alaska	*1.4 billion short tons	*110.7 billion short tons	*1774.0 billion short tons	Does not include an estimated 100 billion tons under the offshore Cook Inlet

* Figures rounded.

Summarized by D.L. McGee and K.S. Emmel, Alaska Division of Geological and Geophysical Surveys, 1979.

Figure 2 (cont'd)

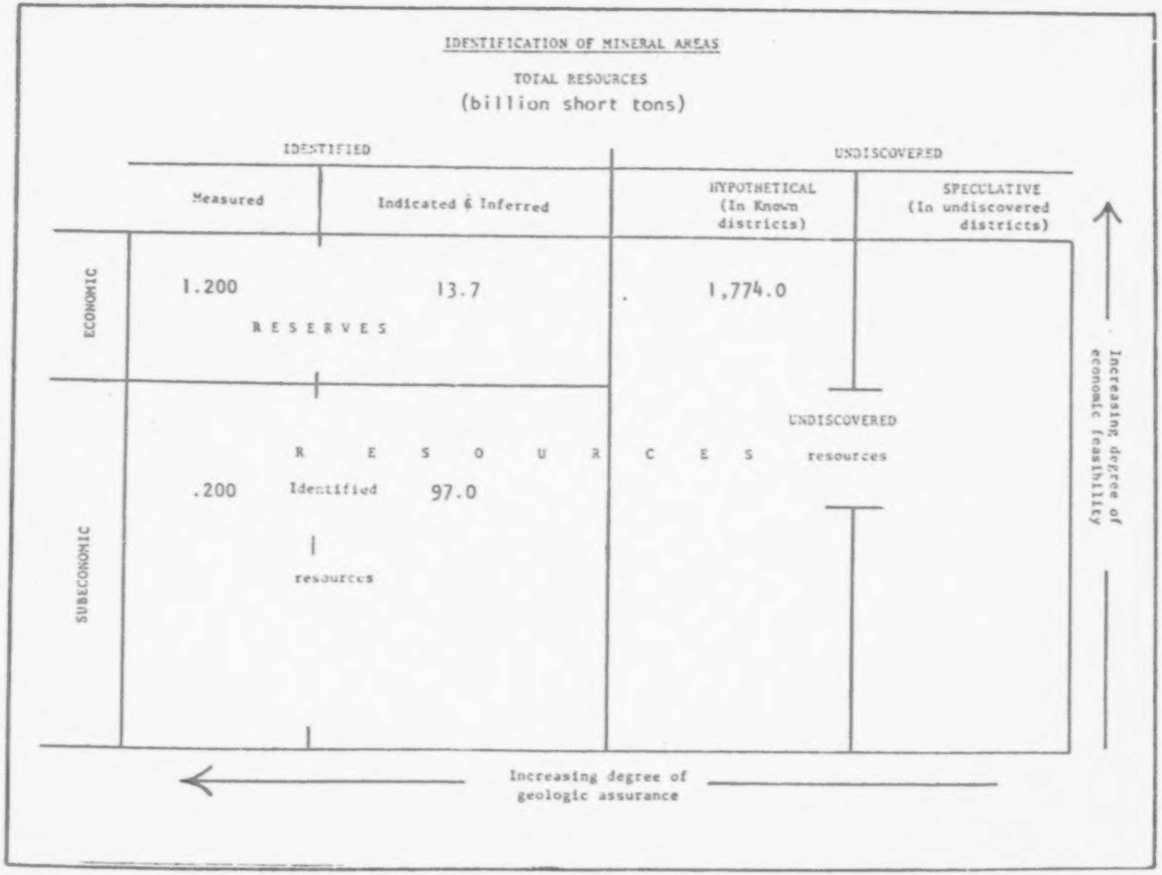


Coal Resources by Area
(billions of tons)

See Alaska Coal Resources Summary (this report) for references.

Compiled by D.L. McGee and K.S. Emmel, Alaska Division of Geological and Geophysical Surveys, 1979.

Figure 3



See Alaska Coal Resources Summary (this report) for references.

Figure 4

CAN ALASKA'S COAL COMPETE WITH WESTERN UNITED STATES COALS?

The Stanford Research Institute in 1974 completed a study titled "The Potential for Developing Alaskan Coals for Clean Export Fuels". This study was directed toward evaluating the potential for development of coals in the Beluga area. Mining costs for developing a moderate to large mine were listed and averaged $5.32 per short ton. Marine transportation costs per long ton (in and out cost excluding cargo handling costs) to Long Beach, California were estimated at $4.90. Since 1974 inflation has increased the cost of mining and transporting coal over ten percent per year and the present cost of landing a ton of coal in the Long Beach area would be in the range of $16 to $18. The accuracy of this range is estimated to be 33 percent above or below the range. Coal from the Beluga area would be competitive with western United States coal of equal Btu content.

In 1975, Joe Usibelli, estimated his price to the customer was $12.00 per ton (FOB).* The shipping rates from Healy to Whittier, 307 miles, were estimated at $7.33 per short ton. Thus the cost of a ton of coal at Whittier would have been $19.33 in 1975.

In 1975, Robert Bottge, U.S. Bureau of Mines, Juneau, Alaska gave a talk titled "Changing Economics of Alaska Coals" at a coal conference in Fairbanks, Alaska. This report estimated the cost of producing one million tons of coal annually in four different areas of Alaska. He also projected these costs to 1978 and compared them with the estimated cost of producing oil and gas on a comparable Btu basis.

Bottge suggested that cost estimates for the four areas may be no closer than plus or minus 33%. The areas are listed below with their economics calculated for 1975 and projected to 1978.

Attigun Area (Northern Alaska) 7500 Btu
Selling price $23.59 ($1.57/Btu)

Healy Area 8500 Btu
$8.60 ($0.51/Btu)

Jonesville Area 12,500Btu
Selling price $17.03 ($0.68/Btu)

Beluga Area 7500 Btu
$9.39 ($0.63/Btu

Projected prices to 1978. Assume a 10% inflationary rate from 1975 to 1978.

Attigun Area $2.30/Btu

Healy Area $0.73/Btu

Jonesville Area $0.98/Btu

Beluga Area $0.90/Btu

An analysis of the proceeding would suggest that coal from the Healy and Beluga areas would be competitive with western coals delivered to a coast city. At the present time the Northern Alaska coals are considered non economic. Suggested costs of mining and transporting western coals from source to the west coast were obtainable only as a range from $12 to $18 per short ton. The accuracy of this range could not be established.

* From a talk given by Joe Usibelli at a conference in Fairbanks, Alaska. 1975.

The effect of Sec. 522 6e (1) and (2) of Public Law 95-87 on development of Alaska coal is evaluated and discussed below:

The bill reads, After the enactment of this act and subject to valid existing rights no surface coal mining operations except those which exist on the date of enactment of this act shall be permitted:

1. On any lands with the boundaries of units of the National Park System, the National Wildlife Refuge Systems, the National Systems of Trails, the National Wilderness Preservation System, the Wild and Scenic Rivers System and National Recreation Areas designated by act of congress.

2. On any Federal lands within the boundaries of any National Forest, may permit mining if the Secretary finds there are no significant recreational, timber, economic or other values which may be incompatible with such surface mining operations.

The future status of land within the boundaries of the National Petroleum Reserve - Alaska has not been defined although recommendations have been made that if enacted would prevent development of coal resources by the most economical method of extracting the coal. Further, the area has not been adaquately evaluated although there are sufficient data to indicate very large coal resources.

Classifying NPR-A into any of the catagories that prohibit coal extraction by surface stripping may prevent development and use of a large percentage of the Nation's coal resources. Extraction of coal by underground techniques is not specifically prohibited although conflict could occur as surface facilities and roads are constructed.

The percentage of coal underlying lands within the boundaries of NPR-A is approximately 83 % of the total coal resources of Alaska. Much of this coal resource is hypothetical and additional exploration will be required to establish this resource as part of the reserve base.

Distances Between Ports* (nautical miles)

Seward to San Francisco	1702
Seward to Tokyo	3000
Seward to Seattle	1234
Nome to San Francisco	2636
Nome to Tokyo	2650
Nome to Seattle	2290

*Distances measured along probable marine shipping routes. Distances not measured along great circle routes. Accuracy is ± 10%.

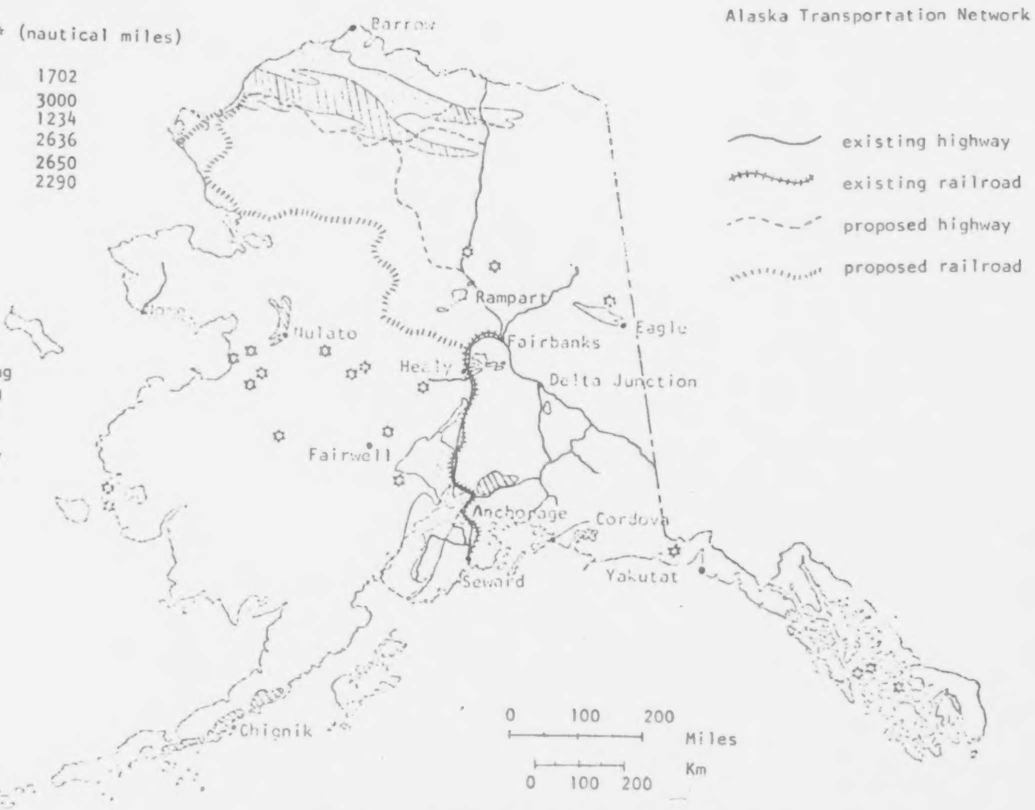
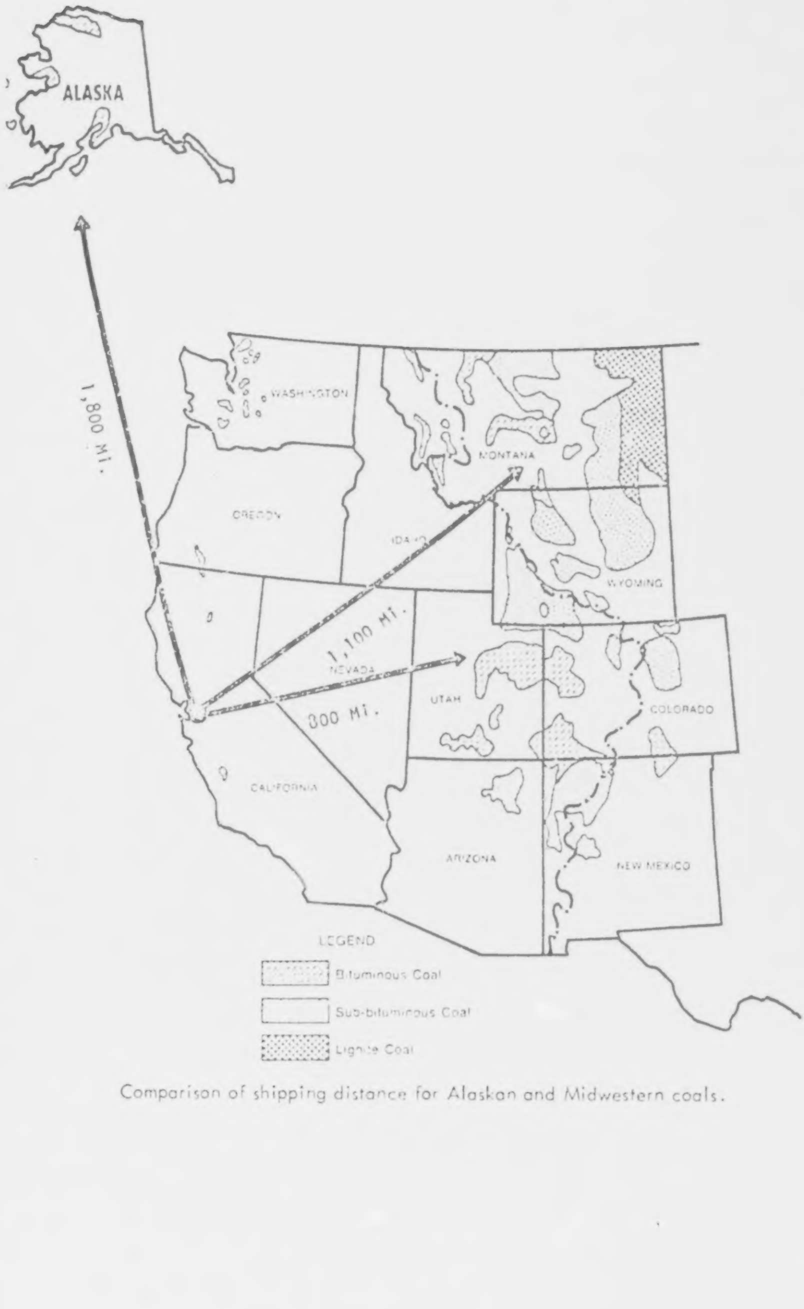


Figure 5

from Wolff, et al, 1973, M.I.R.L. Report no.29.

compiled by D.L. McGee and K.S. Emmel, Alaska Division of Geological and Geophysical Surveys, 1979.



Comparison of shipping distance for Alaskan and Midwestern coals.

Figure 6

ALASKA COAL RESOURCES BY RANK - BILLIONS OF SHORT TONS **

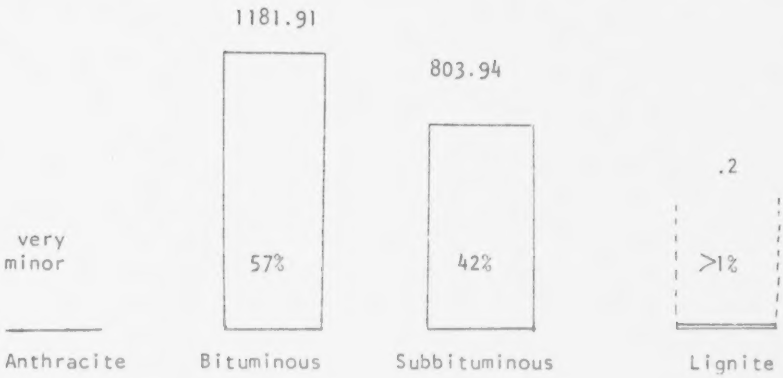
AREA	BITUMINOUS COAL INCLUDES MINOR ANTHRACITE COAL WHERE NOTED	SUBBITUMINOUS COAL	LIGNITE COAL
NPR-A	951	634	--
WEST OF NPR-A	97.2	64.8	--
EAST OF NPR-A	32.1	21.4	--
NENANA	--	15.6	--
JARVIS CREEK	--	.04	--
MATANUSKA*	0.27	Minor	Minor
SUSITNA	--	33.7	Minor
KENAI ONSHORE	--	34.3	Moderate
BROAD PASS	--	--	Minor
CHIGNIK BAY HERENDEEN BAY	0.74	Minor	--
BERING* GLACIER	.5	Moderate	Minor
ISOLATED COAL OCCURENCES	0.1	0.1	.2
* Minor anthracite resources TOTALS			
	1081.91	803.94	.2

** Ratio of 60% bituminous and 40% subbituminous from Callahan in Martin and Callahan, 1978.

Summarized by D.L. McGee and K.S. Emmel, Alaska Division of Geological and Geophysical Surveys.

Figure 7

PERCENTAGE OF ALASKA'S COAL RESOURCES BY RANK *



Lignite percentage
may be much higher

An estimated 50% of the subbituminous coal in Alaska is at the bottom of the subbituminous range approaching lignite.

* Ratio of 60% bituminous and 40% subbituminous from Callahan in Martin and Callahan, 1978.

From: Alaska Regional Energy Resources, Alaska Division of Energy
and Power Development, 1977

Compiled by D.L. McGee and K.S. Emmel, Alaska Division of Geological
and Geophysical Surveys, 1979

Figure 8

ENERGY EQUIVALENT STATEMENT - COAL TO BARRELS OF OIL (42 gal.)

The equivalent energies for crude oil and coals are listed below:

Coal per 2,000 pound ton

Bituminous coal equals 26.2 x 10^6Btu
Subbituminous coal equals 19.0 x 10^6Btu
Lignite coal equals 13.4 x 10^6Btu

Crude oil equals 5.60 x 10^6Btu

Alaska's total coal resource is predominantly bituminous although most of the easily accessible coal is subbituminous. A value of 23.0 x 10^6Btu was used and from this value one ton of coal is equivalent to about four barrels of oil. The values are average values and not precise equivalents.

Alaska's coal resources in billions of short tons and the equivalent in crude oil (42 gal. barrels) is listed below:

Measured Coal Resources
1.4 billion tons equals about 5.2 billion barrels of crude oil.

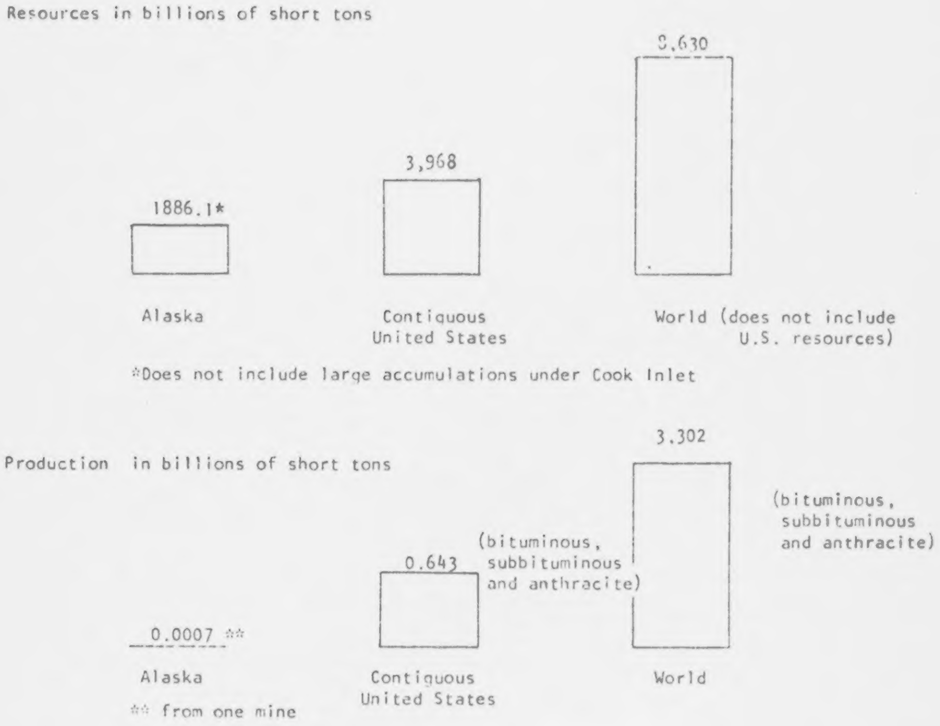
Indicated and Inferred Coal Resources
111.0 billion tons equals about 444.0 billion barrels of crude oil.

Hypothetical Coal Resources
1,761.0 billion tons equals about 7,044.0 billion barrels of crude oil.

For comparative purposes the largest oil field in North America is the Prudhoe Bay field which contains about 9.6 billion barrels of recoverable oil.

Comparison of Resources and Production Values Between

Alaska, the Contiguous United States and the World



*Does not include large accumulations under Cook Inlet

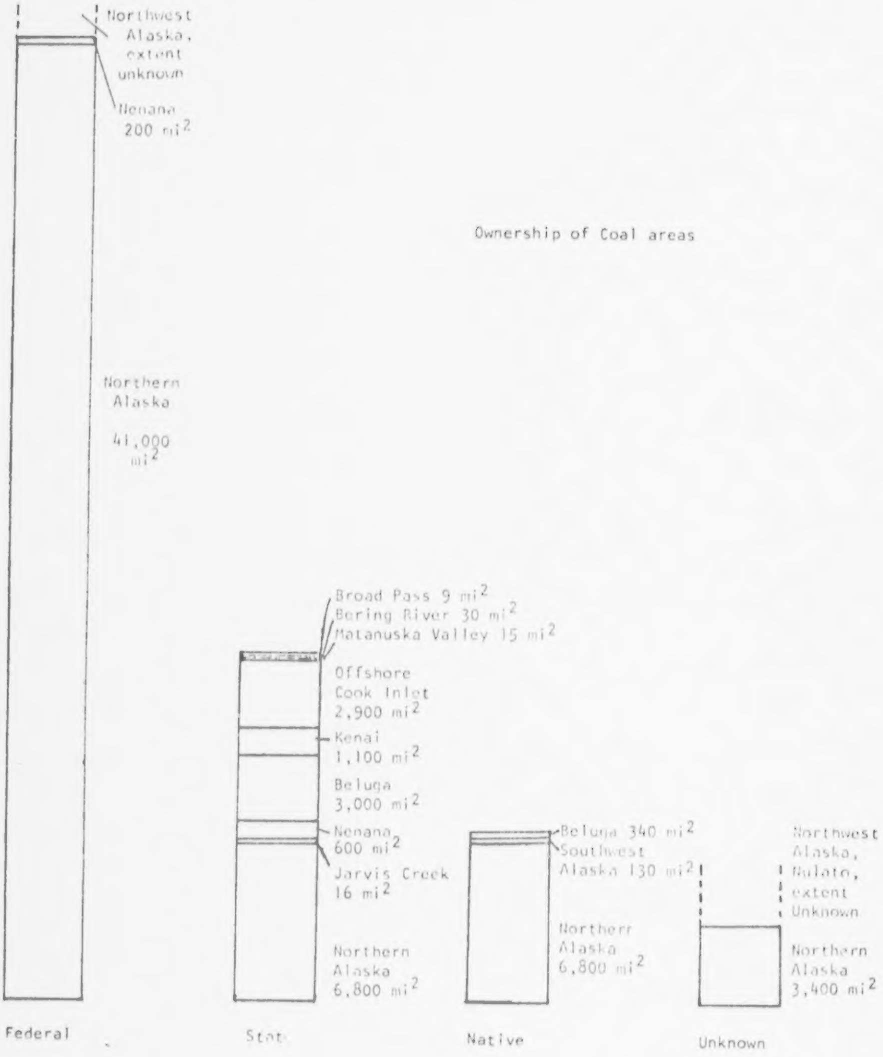
** from one mine

From: Alaska Regional Energy Resources, Alaska Division of Energy and Power Development, 1977.

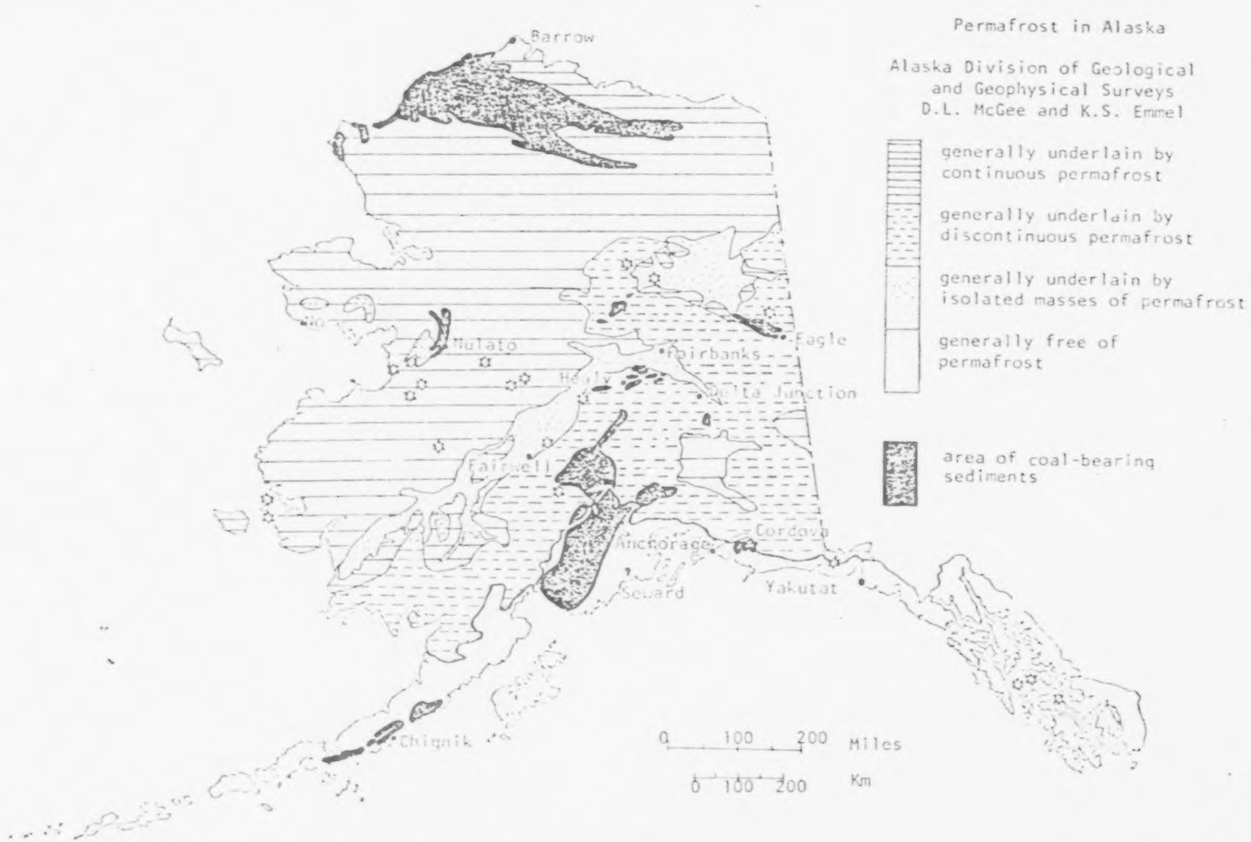
Commodity Data Summaries, 1976, U.S. Bureau of Mines.

Compiled by D.L. McGee and K.S. Emmel, Alaska Division of Geological and Geophysical Surveys, 1979.

Figure 3



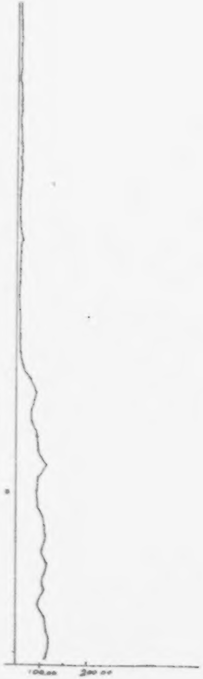
From: Alaska Regional Energy Resources, Alaska Div. of Energy and Power Development, 1977.


Permafrost in Alaska
Alaska Division of Geological and Geophysical Surveys
D.L. McGee and K.S. Emmel
generally underlain by continuous permafrost
generally underlain by discontinuous permafrost
generally underlain by isolated masses of permafrost
generally free of permafrost
area of coal-bearing sediments
Barrow
Mulato
Fairbanks
Eagle
Healy
Delta Junction
Fairwell
Anchorage
Cordova
Seward
Yakutat
Chignik
0 100 200 Miles
0 100 200 Km

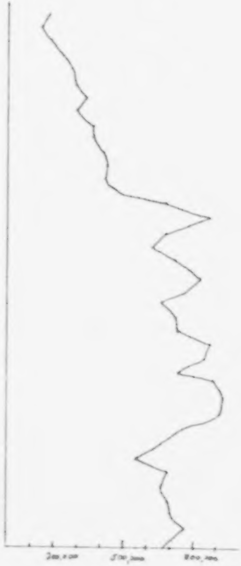
map compiled from Ferrians, O.J., 1965, Permafrost map of Alaska, U.S. Geological Survey map I-445.

Coal production in Alaska 1880-1977

	SHORT TONS
1880	--
1881	--
1882	--
1883	--
1884	--
1885	--
1886	--
1887	--
1888	--
1889	--
1890	6,076 1/
1891	1,033
1892	471
1893	923
1894	478
1895	1,077
1896	[illegible]
1897	2,673
1898	2,452
1899	[illegible]
1900	2,855
1901	2,740
1902	3,052
1903	2,717
1904	1,824
1905	4,314
1906	6,061
1907	10,659
1908	4,066
1909	3,430
1910	2,250
1911	1,950
1912	1,105
1913	2,312
1914	1,190
1915	1,629
1916	12,676
1917	54,275
1918	75,816
1919	60,894
1920	61,111
1921	76,817
1922	79,275
1923	119,826
1924	99,663
1925	82,868
1926	87,300
1927	104,300
1928	126,100
1929	100,600
1930	[illegible]
1931	[illegible]
1932	102,700
1933	96,200
1934	107,500
1935	119,425
1936	136,600
1937	121,600



	SHORT TONS
1938	[illegible]
1939	[illegible]
1940	171,970
1941	[illegible]
1942	[illegible]
1943	[illegible]
1944	354,375
1945	[illegible]
1946	[illegible]
1947	[illegible]
1948	[illegible]
1949	[illegible]
1950	[illegible]
1951	[illegible]
1952	[illegible]
1953	[illegible]
1954	[illegible]
1955	[illegible]
1956	[illegible]
1957	[illegible]
1958	[illegible]
1959	[illegible]
1960	[illegible]
1961	[illegible]
1962	[illegible]
1963	[illegible]
1964	[illegible]
1965	[illegible]
1966	[illegible]
1967	[illegible]
1968	[illegible]
1969	[illegible]
1970	[illegible]
1971	[illegible]
1972	[illegible]
1973	691,010
1974	[illegible]
1975	[illegible]
1976	[illegible]
1977	[illegible]



Total [illegible] 1977 [illegible]

From: Alaska Regional Energy Resources, Alaska Division of energy and Power Development, 1977.

compiled by D.L. McGee & K.S. Emmel, Alaska Division of Geological and Geophysical Surveys, 1979.

Significant Events in Coal Development and Production in Alaska, 1786-1977

1786	Capt. Nathaniel Portlock, English trader, finds coal at Coal Cove (presently Port Graham) on the Kenai Peninsula.
1855	First Alaska coal mine opened by the Russian-American Company at Coal Cove.
1879	Whaling ships and U.S. Revenue cutters start using coal from the Corwin mines along the coast between Cape Sabine and Cape Lisburne, Northern Coal Field on the Arctic Coast.
1888	Wharf Mine near Port Graham opens.
1898	Sternwheelers use coal as fuel to transport gold seekers to gold fields.
1900	Extension of coal laws to Territory of Alaska.
1902	Yukon River steamers convert coal and wood burners to petroleum engines.
1904	Coal Act enacted, allowing coal claim locations without previous surveys.
1906	President Theodore Roosevelt closes Alaska public land to entry under coal laws due to Pinchot-Ballinger feud.
1914	U.S. Congress passes Alaska Coal Leasing Act.
1916	Alaska Railroad is built to Matanuska Coal Field.
1922	Alaska Railroad reaches Nenana Coal Field.
1924	U.S. Navy begins converting its coal burning ships to oil.
1940	Nearly all coal mined in Alaska comes from Evan Jones Coal Mine in the Matanuska Field and Healy River Coal Mine in the Nenana Field. Coal used to power dredges and large placer mining operations near Fairbanks.
1942	Alaska Railroad reopens Eska Mine. Coal needed for new Army Posts and military airfields.
1943	Traditional underground coal mining in Alaska gives way to surface mining methods.
1946	Alaska Railroad converts coal burning engines to diesel engines, Eska Mine closes in Matanuska Field.
1968	Fort Richardson and Elmendorf Air Force Base convert coal fired steam power plants to natural gas. Matanuska Field shuts down except for small local needs.
1973	Organization of Petroleum Exporting Countries (OPEC), a predominately Middle East cartel, set high oil prices and reduced supplies to the U.S., prompting increased demand for other energy sources, including coal.
1977	President Carter's energy policy includes conversion of utilities and industry to coal prompting an interest in opening the Beluga and Jarvis Coal Fields.

GLOSSARY OF COAL CLASSIFICATION TERMS

Resources. Concentrations of coal in such forms that economic extraction is currently or may become feasible.

Identified Resources. Specific bodies of coal whose location, rank, quality, and quantity are known from geologic evidence supported by engineering measurements.

Undiscovered Resource. Unspecified bodies of coal surmised to exist on the basis of broad geologic knowledge and theory.

Reserve Base. That portion of the Identified Coal Resource from which Reserves are calculated.

Reserve. That portion of the Identified Coal Resource that can be economically mined at the time of determination. The reserve is derived by applying a Recovery Factor to that component of the Identified Coal Resource designated as the Reserve Base.

Recovery Factor. The percentage of total tons of coal estimated to be recoverable from a given area in relation to the total tonnage estimated to be in the Reserve Base in the ground.

Identified Subeconomic Resources. The part of coal resources that occurs in Demonstrated and Inferred Resources that is not now minable economically.

Hypothetical Resources. Undiscovered Coal Resources in beds that may reasonably be expected to exist in known mining districts under known geologic conditions. In general, Hypothetical Resources are in broad areas of coal fields where points of observation are absent and evidence is from distant outcrops, drill holes, or wells. Exploration that confirms their existence and reveals quantity and quality will permit their reclassification as a Reserve or Identified Subeconomic Resource.

Speculative Resources. Undiscovered coal beds that may occur either in known types of deposits in a favorable geologic setting where no discoveries have been made, or in deposits that remain to be recognized. Exploration that confirms their existence and reveals quantity and quality will permit their reclassification as Reserves or Identified Subeconomic Resources.

The following definitions are applicable to both the Reserve and Identified Subeconomic Resource Components.

Measured. Coal for which estimates of the rank, quality, and quantity have been computed, within a margin of error of less that 20 percent, from sample analyses and measurements from closely spaced and geologically well-known sample sites.

Indicated. Coal for which estimates of the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections.

Demonstrated. A collective term for the sum of coal in both Measured and Indicated Resources and Reserves.

Inferred. Coal in unexplored extensions of Demonstrated Resources for which estimates of the quality and size are based on geologic evidence and projection.

Rank. The classification of coals relative to other coals, according to their degree of metamorphism, or progressive alteration, in the natural series from lignite to anthracite (Classification of Coal by Rank, 1938, American Society for Testing Materials, ASTM Designation D-388-38 p. 77-84).

Quality or Grade. Refers to individual measurements such as heat value, fixed carbon, moisture, ash, sulfur, phosphorus, major, minor, and trace elements, coking properties, petrologic properties, and particular organic constituents. The individual quality elements may be aggregated in various ways to classify coal for such special purposes as metallurgical, gas, petrochemical, and blending usages.

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Senator MURKOWSKI. Mr. Smith, in view of our interest in Pacific rim countries and in my opening statement I referred to a bill Senator Warner and I are cosponsoring with a number of other Senators in regard to the provision to provide deepwater port capabilities, primarily on the eastern seaboard.

In your opinion, Mr. Smith, what is the current status of the economics of moving coal, western coal in the United States to the Pacific rim or at least in view of the capabilities of our ports?

My question is, Do we need ports that can handle deeper draft vessels or do we need on the west coast simply port facilities that our ports are adequate in their water depth at the present?

Mr. SMITH. I believe there are speakers to follow who can address this question in greater detail than I. My understanding is that the ports in the Puget Sound area could be developed to take ships of up to a 120,000-ton size, which is necessary, in order to achieve economy of scale and to compete in the movement of steam coal.

The ports of Los Angeles, Long Beach have currently a draft that is better than the ports on the east coast, but how much development would be needed there for them to accommodate ships of a similar size, I reserve for somebody who can answer the question better.

But I would say that until the United States can develop port facilities or some other method of getting its coal into the host of ships by slurry or some other method, in the size that I have mentioned, greater than 120,000 deadweight tons, we are going to be acting under a very severe economic disadvantage.

Senator MURKOWSKI. You mentioned some other method and I believe you just commented on possibly slurry. Could you just for the record indicate to the Chair the current status of contracts—term contracts that are of significant magnitude from what we know as western coal reserves and are destined for the Pacific rim distribution and how that coal will be moved into what port. These would be, of course, major contracts?

Mr. SMITH. If you are speaking of major contracts and significant contracts and measuring significance in relation to the size of the market and the size of our resources, we have none. We are at the very beginning of our marketing activity. We are shipping what 10 years from now will be looked upon as trial quantities.

We have yet to prove that we in America can move our coal and get into the host of ships at a competitive price and until we prove that we are unlikely to secure long-term contracts as we know them.

Senator MURKOWSKI. Would you agree that we have established that on the east coast, however, as opposed to the west coast?

Mr. SMITH. Yes.

Senator MURKOWSKI. And the reason for that cannot be the extraordinary capability of the east coast coal ports but rather what?

Mr. SMITH. The east coast has been exporting coal for 50 years. It has this year established a new world record for the export of coal. We are dealing with companies that are established and are a part of this coal club that I mentioned. They have been dealing in the international market, including Japan, for 20 years.

They have established themselves thoroughly. The western coal companies have yet to do this. Now some of them are doing this extraordinarily well and have established good marketing initiatives and organizations, but it is early days for this western trade and while the companies themselves have undeniably the capability of producing coal and of getting the coal into rail cars, we have yet to demonstrate to our overseas customers, and you can ask this same question of them, when they appear here, they have yet to demonstrate to our overseas customers that we can do this on a bigger scale.

We have proven that we can ship a few million tons, but we have to talk now about 20 or 30 million tons and we don't have that capability yet.

Senator MURKOWSKI. I would like your opinion on what we might have to do to obtain that capability, recognizing that we acknowledge that we have the capability to the east coast. I might observe that at a previous hearing one witness commented that we really did not need to go to the trouble and expense of deepening our ports to sell coal to the European countries, because they were familiar with our coal—its quality—the best buy in the world and its enormous quantity, they would be willing to take it in smaller shipments if they had to. That situation does not exist in the Pacific rim market, as those countries can go some place else for their coal or they can go to the United States.

But you are inferring that we don't have quite the same infrastructure established for the western as we do eastern coal. Yet we have deeper ports, it is my understanding. Certainly on the west coast we have the railroads for hauling it further. What is lacking? You say we have not demonstrated an ability.

I am sure that any number of western coal companies would like to have an opportunity to demonstrate that ability with a term contract, but the question is which comes first.

Mr. SMITH. Undeniably it is a difficult problem and it has, there is a lot of circular logic here and chickens and eggs and which comes first. To answer your question in sequence, it is true that we can ship coal from the east coast in smaller ships economically. We can do this because of two reasons, one, because of shorter sailing distance and, second, because the reception ports in many cases can only take smaller ships.

This is true of Spain and of the Scandinavian countries with the exception of Denmark. They are starting to develop larger ports, however, and ports capable of taking up to 150,000 tons. When they get those larger ports, the people that are able to load coal into larger ships are going to have an advantage.

However, there will always be a small ship trade in Europe. When you look at the Far East, however, we have much longer sailing distances where the economies of scale and larger ships have a more profound affect and the ports there are being built to accommodate large ships. And the two big coal ports, the coal terminals that are being planned for Japan will take very large ships where they will break bulk and make distribution into the smaller ports into Japan and where, if we were to attempt to compete with that by shipping 30,000-ton ships from Long Beach to Japan, I doubt that the economies would stand up.

So there is a great need for larger ships in the Pacific than there is in the Atlantic. In terms of demonstrated capability, I agree, we are over a bit of a barrel here. We have the coal. We have the railways. We are ready to sell it. We have ports through which this coal can go and coal is moving, but it is not moving in the size of tonnages that would be needed to give these foreign buyers the absolute conviction that they can place themselves in our hands.

And building up this confidence is going to be a step-by-step process. And we get into this vicious circle. The ports are prepared to deepen and expand their facilities if they have throughput contracts. The mines are prepared to contract for this coal.

The foreign countries are prepared to contract if they can be assured that the ports are going to be there and we go round and round this circle. Somehow it has got to be broken or the circle will just gradually disappear over a period of years as the trade slowly builds up.

The problem here is in the ports themselves and as I indicated there apparently are people present from these ports who can speak to the problem. But one question that we hear aired repeatedly in discussing this problem with our overseas friends is can the ports of Long Beach and Los Angeles be developed to the point where they can take unit trains of coal down from Utah and are they going to be permitted environmentally to pass through this heavily builtup region and have large coal piles sitting in the ports.

And so far nobody has demonstrated to their satisfaction that this is going to be permitted.

Senator MURKOWSKI. So you might list then that the environmental concern would be one of the primary factors standing in the way of other port development in either of those areas?

Mr. SMITH. It is certainly the concern of the customers.

Senator MURKOWSKI. My understanding is at a later time we intend to call representatives from the various ports, a wide variety, to have them prioritize what they foresee as their main problem standing in the way of development. Let me ask you one more question. It is my understanding that in the case of the Australian coal industry the Japanese have gone in with a rather detailed and elaborate scheme of assistance. Do you think this is paramount, the financial system is what I am referring to, and I don't believe it is necessarily an equity position, to getting long term contracts with Pacific Rim Countries. This financial assistance is a variable not normally being available in the trade, not that it is not available in other resource industries in the United States, where the Japanese have an equity participation. Is this one of the reasons for the reluctance of Pacific Rim Countries to commit to any long term contract?

Mr. SMITH. With the United States?

Senator MURKOWSKI. Yes.

Mr. SMITH. Yes. It definitely has, there are two aspects of this. One, these countries have sought capital to do development of their mines and the necessary socal infrastructure around them. In Australia, the development of mines is far more expensive than it is in the United States, because you are dealing with the mines in the back and there has to be put in place the whole social structure to support it, schools, roads and power and so on and this represents a very large drain on their capital resources.

And so they are in a rut. They are caught in a situation, however, where they wish the capital but they don't want the foreign control. So they gauge this very carefully, they will accept large foreign investment at the beginning of the project provided that this is gradually tapered down and diluted until the entire system is under Australian control.

Canada follows a similar policy and has welcomed Japanese and other investment. The major benefit of this investment, however, is that the customer knows intimately the stages of progress of the development and feels a part of it and has sufficient confidence that he gives these projects his long term contracts.

It is natural; he has got his money there and he puts his orders where his money is. Now such investment opportunities are open in the United States, but they have not been taken up quite as avidly as they have in Canada and Australia in relative terms.

Another reason why Canada and the United States are tending to get the longer term contracts is that the United States itself, by virtue of the structuring of its industry, has and probably always will have a production surplus, an overhang of productive capacity.

In Australia and Canada these big development projects tend to be more accurately and well-planned by a few very big companies who handle their capital resources very carefully and they only commit the capital resources necessary to fulfill the contracts that they have in plan or in place.

Here because of the fractured nature of our industry, somebody hears there is an export market so they start putting capital in and so on. Also a number of our mines are smaller and we cannot control our capital investment quite to the same extent. You cannot buy half a bulldozer.

So we tend then to have, to be classed and put into the position, and it is not a bad position to be in, of being a swing producer, a market of last resort. America is always going to be there. So that this releases the foreign customer then to execute a number of long term contracts for a portion or percentage of this input knowing that he can always come to the United States as the swing producer.

And that has characterized our metallurgical trade. We have not had big, long term contracts in the metallurgical trade either, 5, 8 years and so on. And I think this is what we are going to also have in the steam coal trade. Once again it is not a bad position to be in.

This does not mean that we are not going to get any long term contracts, not at all. But I think the long term contracts that come to the United States are going to come later, when a number of things have happened, when there is a much greater demand. The demand now is gradually rising as these new plants are being built. But around 1986, 1988 the number of plants coming onstream rises very rapidly and it is then that there is going to have to be a bigger, there will be a bigger rush for U.S. coal.

Senator MURKOWSKI. You are suggesting then that these new plants that will be on line in a few years will not necessarily tie into any long term contracts at this time. Some of them do and some of them don't, but a number of them have the flexibility then to go out and make a deal.

Mr. SMITH. There is still a lot of open contracts, absolutely.

Senator MURKOWSKI. Well, I think generally we agree that the eastern coal will move to Europe and continue to move to northern Europe because economically it is the best buy available on the world market. We have acknowledged that there is a conversion taking place in the Pacific rim from crude oil steam to coal.

There are certainly other markets to designate healthy competition, that would be Australia, South Africa, and what else?

Mr. SMITH. Canada.

Senator MURKOWSKI. Canada. Do you think that ultimately the United States, Western United States will play a parallel role to the Eastern United States just because it will be economically competitive to have western coal or—excuse me the western coal will be marketed so it will be economically viable in the marketplace with the existing infrastructure which pretty much limits movement by railroad vis-a-vis slurry as an alternative?

I am implying, of course, that just because we are there, just because we have the swing of excess coal, as the conversion takes place, is ours under the present mode economically acceptable in the marketplace today or will the countries look to the countries of Australia, Canada, and South Africa?

Mr. SMITH. Yes. If you are asking the question can we compete in the marketplace, the answer is yes. But to compete in this market we have to, the whole answer lies in developing better and more cost-effective transportation, whether that be overland transportation, the coal handling and storage at the ports, or in shipping, but it is not in coal production that we will achieve economies nor need we.

We are competitive in bringing coal to the surface with Australia, Canada, or any other place. Our biggest deficiency, however, is in and the biggest problem is in getting this coal to its customer. And anything that—to give you an example—oil moves in international trade with about 5 percent of its delivered price accounted for in transportation.

The delivered price of coal is anywhere from 50 to 75 percent transportation. So the coal industry is not one of hacking and hueing, it is moving and it is in the movement of coal that we have to achieve economies in order to be competitive.

Now, we are at a disadvantage here with the possible exception of your State, where you have got coal within 15 miles of deep water. You don't even need a railroad. You can move it buy conveyor belt and that is a prized advantage.

Senator MURKOWSKI. We might have to put a little crude oil in it to get it to burn.

Mr. SMITH. In the winter time. Oh, you are quite right; it has disadvantages in its lower cal rate and so on. But undoubtedly a market will be found for that. But just to repeat, yes, we are competitive and we can be competitive today and we will move some coal today through our very insignificant export infrastructure that we currently have in place.

Now, I am not talking about plans, but when those plans have been developed and we can export at least five times the amount of coal that we currently have the capability of doing, then I think we will start to achieve these long-term contracts.

Senator MURKOWSKI. Let me just interrupt you for a moment. I would like to relate to you one point where you said, we can get it out of the ground, but we have a difficult time in the movement of it, and we are moving most of our coal to the east coast, a shorter distance. But we are moving it by rail and in the west coast the rail is the obvious established capability, but we are moving it along. Is there any proportional deficiency? Recognizing that we have greater distance on the one hand to the west coast vis-a-vis the east coast, is the rail more proportionally the same or is there an equal application in the movement west? You have a greater distance to cover to the western ports than the eastern local ports. Other than that, is the proportion of cost the same to the two regions or is it in the lack of physical handling capabilities once you move it to the loading zone this lack—where the costs are greater?

Mr. SMITH. Giving a comparison between the east and west railways is not our specialty and I would be guessing and I don't guess, but you have Mr. Michon here from Burlington Northern, who I think could address part of that problem at least.

There are two things about the western rail network. Some of our major coal fields have yet to be linked up and particularly those in southern Utah. Here is the biggest repository of the highest grade steam coal on the western slopes and there is no way of moving it.

Senator MURKOWSKI. No way to move it?

Mr. SMITH. No.

Senator MURKOWSKI. When you say no way, you mean no established way?

Mr. SMITH. Correct. Of course, it can be moved if you build a railroad or slurry lines or something, but right today there is no way of moving it. But assuming that the railways are adequate and could be expanded to move more coal than they now are moving, it is the ports that are the greatest deficiency at the present time, absolutely.

Senator MURKOWSKI. I think you have covered, Mr. Smith, a very broad area of questions this morning and you have been very informative in my limited participation. On behalf of Chairman Warner, I would like to thank you for your outstanding testimony.

I clearly recall your statement that you would not like to guess, so I am looking forward to asking some of the questions you did not respond to or care to guess at, to some of the witnesses that will be following you. Again I want to thank you for your outstanding testimony and helping, I think, establish a great record as we pursue our marketing of coal in the Pacific rim countries. Thank you very much.

Mr. SMITH. Thank you.

Senator MURKOWSKI. Our next witness will be Mr. Phil Burgess, executive director, Western Governor's Policy Office and study director, Western Coal Export Task Force, Denver, Colo. And accompanying you will be Mr. Herbert Greene. Mr. Greene is the senior vice president, Lone Star Industries, Greenwich, Conn. and——

Mr. BURGESS. Travis Montgomery, Mr. Chairman, who is the executive secretary of the Port of Long Beach. We anticipated your questions.

Senator MURKOWSKI. Please go ahead. I understand you do not have a prepared statement.

Mr. BURGESS. That is right, Mr. Chairman, we are just in the process of completing a 9-month-long joint study of ways and means to expand western coal export to the Pacific basin and particularly to Japan, Korea, and the Republic of China.

Senator MURKOWSKI. When will that be released?

Mr. BURGESS. It will be released on December 10, and with your permission, we would like to submit that report for the record.

Senator MURKOWSKI. We would appreciate that and it will be so ordered as part of the record.[1] Please deliver that as soon as you get it.

Mr. BURGESS. Thank you very much.

STATEMENT OF PHIL BURGESS, EXECUTIVE DIRECTOR, WESTERN GOVERNORS POLICY OFFICE AND STUDY DIRECTOR, WESTERN COAL EXPORT TASK FORCE, DENVER, COLO., ACCOMPANIED BY HERBERT B. GREENE, SENIOR VICE PRESIDENT, LONE STAR INDUSTRIES, GREENWICH, CONN.; AND TRAVIS MONTGOMERY, EXECUTIVE SECRETARY OF THE PORT OF LONG BEACH

Mr. BURGESS. I would like to just highlight what appear to be some of the major findings from our report and to preface those comments by pointing out that our study, Mr. Chairman, has been a joint effort between the public and the private sector in the United States.

It has involved more than 40 coal producers, the 6 major western railroads, more than 20 ports on the west coast and 15 Governors. The study has been financed jointly by Japan, Korea, the Republic of China, and the Western U.S. industry people.

This study came about because of persisting discussions about the chicken and the egg problem in the Pacific basin. The chicken and the egg took the form of the hesitance of the Pacific basin steam coal users to consider long-term, large-volume contracts without the assurance that adequate production, inland transportation and port handling capacity would be developed on the U.S. side and the reluctance on the American side of U.S. mine, railroad, and port operators to invest in such facilities until the long term, large volume contracts were signed.

So the first thing we did in this joint effort with the Pacific basin partners was to look at the chicken and the egg issue and it really takes two forms. The chicken and egg issue takes the form that the United States lacks the capacity to deliver and it also takes the form that the U.S. coal, Western U.S. coal is not cost competitive.

Let me deal briefly with each of those. With regard to capacity, our report will show and detail the location of more than 100 operating mines in the Western States. For each of those mines it will provide detailed information on quality of the coal, on the Btu contents, et cetera.

We also point out that in 1970 the Western States produced 29 million tons of coal, only 6 percent of the U.S. Supply. By 1980 it was 180 million tons, over 25 percent of the U.S. supply and by 1990 it will be between 400 and 600 million tons, over 50 percent of the U.S. supply.

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[1] See appendix I.

That number is important, Mr. Chairman, because even with the maximum penetration of the Pacific basin market, the Western U.S. coal producers can supply that market with maximum penetration with less than 10 percent of our production and that is a significant number in terms of some political and environmental and other considerations that have been important in the past.

The other thing I can say about supply is that we show that in 1985 more than 30 percent of the Western U.S. production remains uncontracted and by 1990 over 40 percent. So no matter how you look at the supply situation in the Western United States, we have the existing capacity in place to deliver the coal at any level, at any quality that is required by Pacific basin users.

Second is transportation. It has been alleged in the chicken and the egg issue and in almost every major report that has come out, including Federal Government reports, the EIS report, and the Woolco report and others that we do not have the transportation, the inland transportation capacity to carry the coal to the ports.

In order to deal with that issue, we undertook a detailed capacity analysis of eight major western railroads. These include the Alaska railroad, the Sante Fe, the Burlington Northern, the Denver & Rio Grande, the Southern Pacific, the Union Pacific & Western Pacific.

The way we did this, Mr. Chairman, was to divide the railroads up into line segments, where each line segment is characterized by the signaling capacity, the signaling system and the tracks, the dual tracks or single tracks. And in the Western United States in those 8 railroads, we have 59 line segments that are somewhere under 100 miles long to several hundred miles long.

And the punchline is that in 53 of those 59 rail segments, we have latent capacity; we have excess capacity. In only 6 out of 59 rail segments does the capacity approach the bottom number on the limits. So the details of this will be provided in our report, but the punchline on inland transportation is that we have in place today the capacity in 53 of 59 line segments on western railroads to carry the coal to the ports and on the sixth where capacity limits are approached, we have the ability in terms of capital and in terms of permitting and other requirements to expand that capacity.

In short, on the inland transportation we clearly have the line capacity, the financial capacity and the management capacity, to carry the coal in any volumes that might be required by Pacific rim users to west coast ports.

Ports, that is an issue that I know concerns this committee and concerns you and it is an issue that has been a major concern of the report. We did a survey of every port on the west coast that has an interest, immediate or long term, in exporting coal. And out of more than 35 ports on the west coast, we identified 26 ports that have an interest in moving coal. Seven in Puget Sound, six on the Columbia River, seven in the San Francisco Bay area, three in the Los Angeles-Long Beach area, and two on the coast of Oregon and Washington.

In each of these cases, we found that there is capacity existing to move substantial volumes of coal. In 1980, for example, the Western U.S. ports shipped 600,000 tons of coal. In 1981 they will ship more than 5 million tons, in less than a year. I think more than anything that shows the western port operators have clearly demonstrated their ability to expand capacity to meet expanding throughput requirements.

In addition our report will lay out for each of these 26 port sites plans for expansion, requirements for dredging, deep draft, and shallow draft plans and today our group includes two people who have important ports and they can answer questions related to that.

In short, Mr. Chairman, we feel that there is no chicken and egg problem on the capacity issue. We know clearly that the capacity exists that is contrary to most reports that have come out in the past, we think the evidence we will present back up those conclusions as persuasive.

We have the capacity in place to produce and carry expected demand. What about the price issue? Today the difference between the CIF price of American western coal and Australian coal, for example, in Tokyo, for example, is about $10. The question is how do we become cost competitive?

As the previous speaker noted there are two principal cost components in the total CIF coal price to Pacific basin users. One is inland transportation and the second sealift. And as pointed out a minute ago, inland transportation can take 25 to 40 percent of the total price, sealift 15 to 25 percent. You get up to 70 to 75 percent of the total cost of delivered ton of coal in the inland and sealift portion of the transportation.

So that means, Mr. Chairman, that transportation provides the greatest leverage to achieve new cost efficiencies. We have identified four areas where cost efficiencies can be achieved. First, with regard to railroads there are two. The Staggers Act represents an entirely new regulatory environment. It provides an opportunity to contract for long-term freight rates at reasonable prices.

That is a new opportunity that buyers and producers both need to take full advantage of. Second, on the inland transportation with railroads, there is an opportunity to implement inland transportation services, namely, unit trains, that take advantage of modern management techniques and state-of-the-art rolling stock.

It is very important for everyone to understand that the movements of coal to the west coast today are not moving on unit trains. They are moving in bulk train loads and by other methods, but they are not moving in shuttle-type trains that go from a single point of origin to a single point of destination with the train dedicated to that movement.

That is what a unit train is. It provides tremendous opportunities for cost efficiencies and the movements today are not by unit trains. Therefore, any extrapolations of future costs from present costs or future prices from present prices will ignore all of the opportunities that are created by unit trains and by the Staggers Act.

Accordingly, it is very important that the advantages are fully recognized and it is also important that everyone recognize that those advantages can be achieved only with long term, large volume contracts. That is the only way you can have unit trains and contracted rates.

On inland transportation also there is the pipeline possibility, slurry pipelines, including the conventional water slurry, the nonwater slurry, coal oil mixtures, synthetic fuels, ethanol and methanol, CO_2 and others. In addition, there is a new technology developing, capsule pipeline. Capsule pipelines essentially involve putting coal in 4-ton loads in a pipe, like a long weiner, maybe 30 feet long, 36 inches in diameter, and floating those down to the pipeline to the port.

Some very interesting explorations are now underway with the capsule pipeline technology. It helped solve some of the silinatry problems on the Colorado River, for example, and those bear watching. So on the inland transportation side, there are two significant options to get cost efficiencies on the railroad side and there are alternatives to railroads that bear watching.

On the sealift, as the previous speaker said, there are tremendous opportunities to achieve new cost efficiencies with deep-draft vessels. And on the west coast we have in Long Beach and in Puget Sound the capacity to use deep-draft vessels.

In addition, as the previous speaker said, I think our report will also say that coal is going to move in many forms and in many kinds of vessels, but we need to take advantage of cost efficiencies in that area. So when we look at the chicken and the egg problem, not as a capacity issue, where we clearly have the capacity, but as a cost-competitive issue, there are significant opportunities in inland transportation and in sealift to reduce our costs.

But none of those reductions can occur unless there are long-term, large-volume contracts. When we look at the—let us shift to the demand side. Our report will detail demand requirements for Pacific basin countries and especially for Japan, Korea, and Taiwan. But in general we are looking at something like 60 to 70 million tons of aggregate demand for steam coal in 1985 and somewhere between 100 and 135 million tons of aggregate Pacific basin demand, import demand in 1990.

Perhaps the most important finding in our study though is that the structure of the demand will change significantly after 1985. That is today the demand for steam coal is dominated by the cement industry and by other nonpower industry sources, but by 1985 and after, the electric utility industry will go from about 25 percent of the aggregate demand today to almost, well to 60 to 80 percent by 1990 and higher thereafter.

So the key to the future from the point of view of the joint study we have been involved in is clearly the utility industry. We believe that in the future the ability of the Western U.S. coal producer to increase his market share will be a function of the skill of that producer and the railroad and the port to sell the coal, but it will also be a function of the market environment and that market environment includes cooperation of State government and Federal Government and that is one reason the Export Western Coal Task Force was put in place to make sure that the political leadership in our States is behind coal exports.

Second, it will depend, the market environment will depend on the commitment and practice of Pacific basin coal users to truly diversify their sources. Today the policy is a policy of diversification, but the practice is one of dependence on a single source. And much depends on their commitment to carry out and practice what their policy is.

And third is the commitment of all concerned to improve the trade balance and other relationships that exist among the buyers and sellers. So we believe in the future the utility market represents the key to expanding coal trade to the—from the Western United States to the Pacific basin. Because utility demand represents a long-term, stable, large-volume demand, the kind of commitment that is required to trigger the investments that are needed today to deploy the innovations and transportation systems, to achieve the cost efficiencies in the coal chain that will make U.S. coal cost competitive on a delivered Btu basis and to provide the infrastructure, and this is very important, to provide the infrastructure to move more U.S. coal if and when supply elsewhere is interrupted by whatever problems.

So we believe that from the prospective of Japan, Korea, and Taiwan, it should be in their interest to purchase a fixed percent of their steam coal requirements for utilities from Western U.S. suppliers. What that percent is depends on the total utility demand and the throughput from the United States that is required to deploy the cost-efficient unit trains, large vessels for sealift, pipeline transportation systems, and reasonable contracted rail rates.

What that percent is, it is clearly more than 15 percent. It is probably less than 45 percent. And in our final report, we will try to lay out what would happen at different percentages of market share in terms of investment by the private sector, not by the public sector, investment by the private sector in the United States on the infrastructure that is needed to become cost competitive.

In short and in conclusion, Mr. Chairman, we believe, first, that in the—it is in the interest and in the mutual interest of the United States and in Pacific basin countries to expand coal trade; second, that it is in the interest of Pacific rim nations to achieve supply diversification and, third, that the United States has the production and transportation capacity to deliver needed quality and quantities of coal over the short term and we have the capital, the manpower and the ability to expand capacity to meet expanded demand over the long term.

And, finally, fourth, that the access by the United States to a significant share of the utility market is keyed to achieve coal chain cost efficiencies that will make western U.S. coal price competitive. With that result, the buyers achieve cost efficient supply diversification and supply stability insurance in case problems arise elsewhere and the sellers receive the investment incentives that are required to put in place cost saving methods that can achieve price competitiveness.

Thank you very much.

Senator MURKOWSKI. Thank you, Mr. Burgess. You indicated, I believe, that in 1980 25 percent of the U.S. production came out of the west coast and was exported to the Pacific rim.

Mr. BURGESS. No. I indicated that 25 percent of U.S. production came out of the West, a very, very small proportion of that was exported.

Senator MURKOWSKI. Where did it go? Was it used primarily——

Mr. BURGESS. Most went to utilities in the midwest and in the South, in Texas primarily.

Senator MURKOWSKI. And you anticipate that 50 percent will be achievable within the next 10 years or thereabouts?

Mr. BURGESS. That is correct.

Senator MURKOWSKI. That will be as a consequence of export to the Pacific rim. Is that correct?

Mr. BURGESS. No. The 50-percent increase will be as a consequence of—the increase to 50 percent will be as a consequence of domestic demand. That will come from utilities outside of the region as well as the expanding population in the energy industry itself.

Senator MURKOWSKI. You have got no provisions, sir, or are not making any forecasts in 10 years for the, what I would assume, would be the eventuality of exporting western coal in the Pacific rim countries.

Mr. BURGESS. Well, we are showing, as I said, we are showing uncontracted capacity in 1990 of over 40 percent. And that means that even though we will have substantial increases from domestic demand, we can ship up to say 40, 50 million tons into the export market with existing coal production.

Senator MURKOWSKI. We are not importing any coal on the west coast for stationery power generation?

Mr. BURGESS. No.

Senator MURKOWSKI. I assume the reason we are not is we can produce it cheaper than we can import it.

Mr. BURGESS. That is correct. There is some thought of importing coal from Mexico into Texas now.

Senator MURKOWSKI. But that is true, we have alternatives in gas as well. I am interested in your reference in your Statement on having the capacity and your reference to the cost efficiencies, and I am wondering if you feel these cost efficiencies are mandatory in order to break into the export market in a large way from the standpoint of developing long-term contracts. When you talk about cost efficiencies, I got the impression that the sea lift was about 15 percent and that could be overcome by larger vessels perhaps, but where 25 percent of the cost was associated with the movement, I gather, from the mine mouth to the ports, you felt that this was perhaps excessive. I would pose the same question to you that I posed to Mr. Smith, who indicated that perhaps others would be more knowledgeable, if there is any proportional difference between the acknowledged method of moving coal, namely, railroad, shorter distance from the terminal, vis-a-vis moving western coal from Wyoming, Utah by rail, are we not competitive in moving western coal vis-a-vis the eastern coal or do we have a different set of apples and oranges to overcome?

Mr. BURGESS. Clearly in the West we have much longer distances.

Senator MURKOWSKI. Once he gets it loaded, do you just move it, you don't handle it?

Mr. BURGESS. We have longer distances, but that is not the only issue, the other related issues having to deal with the size of the source of supply on the originating end and the requirements for blending and other cost created methods on the receiving end.

Senator MURKOWSKI. Is this mixing and so forth a responsibility of the carriers moving the coal to the deeper water port or is it the responsibility of the marketing aspect once the coal is there?

Mr. BURGESS. As far as the west coast export market is concerned, blending is not a major issue. The coal would come from single source mines in most cases and it would be stored at a port and blending is not a major issue as it is with metallurgical coal.

Senator MURKOWSKI. Well, in a few words, in your opinion what would you suggest are the reasons we have not been able to effect some term contracts for the movement of large tonnages of coal from our west coal ports? They have all indicated an interest in it.

Mr. BURGESS. Yes. I think the major reason, Mr. Chairman, is that western U.S. coal is not price competitive at this time. A major reason it is not price competitive vis-a-vis Australian coal is because we have very large inland transportation costs. Efforts to reduce inland transportation, methods to reduce inland transportation costs, and sea lift costs are well known. They can be put in place, but in every case those methods require long term, large volume commitments or else private investment will not create those cost savings.

Senator MURKOWSKI. You are saying unitized movement, unitized trains would be a substantial addition.

Mr. BURGESS. That would be a major method, yes.

Senator MURKOWSKI. And that would come about if there were long-term contracts available?

Mr. BURGESS. Right.

Senator MURKOWSKI. Another area that I was a little surprised that you did not cover was the environmental aspects of moving coal out of western ports. Perhaps Mr. Montgomery would comment on the posture of Los Angeles Harbor, as a coal port. Recognizing that, I think, there has been an effort to bring liquified gas down from Kenei, Alaska to Long Beach that has been pending for some time and I might ask what the current posture of that proposal is before we get into the coal.

Mr. MONTGOMERY. Well, certainly we think that environmental is one of the major hurdles that we as a port have to overcome, probably the major hurdle that we have to overcome.

Senator MURKOWSKI. How are you doing on it?

Mr. MONTGOMERY. Quite well. We are in the process now of doing an EIR, doing our preliminary engineering. The Corps of Engineers is working very strongly with us in that regard. There is a new change in the national interest, of moving forward on coal. The administration has been very helpful and supportive through Secretary Morris at Commerce and his task force on coal to try to help speed up some programs in that regard.

Most of the major bills that are up before congress right now on port issues all have something to do with and the one common place all the ports agree is the environmental process and the permitting processes.

Senator MURKOWSKI. Are you familiar with the application by, I think, one of the subsidiaries of Pacific Gas and Electric between Kenei, Alaska and the port of Long Beach?

Mr. MONTGOMERY. I think that was the port of Los Angeles.

Senator MURKOWSKI. That has been pending for several years.

Mr. MONTGOMERY. No, I am not. It may be the port of Los Angeles. The big one that we went through, of course, was Sohio.

Senator MURKOWSKI. Yes, to do it by pipeline to take it into Los Angeles and move it across the southwest.

Mr. MONTGOMERY. No, that was going to Long Beach and we were not able to accomplish that after 7 years of permitting processes and we think now we see some light to change that.

Senator MURKOWSKI. Well, I was just wondering as a consequence of the current status of the efforts to bring the LNG down, I think it is liquified natural gas from Kenei.

Mr. MONTGOMERY. That is into the port of Los Angeles.

Senator MURKOWSKI. No, it is the port of Long Beach. Is it not?

Mr. MONTGOMERY. No, it is the port of Los Angeles.

Senator MURKOWSKI. And the status of that has been delayed depending on the outcome of the recommendation by, I believe, the Governor's advisory board of some type—I guess my question is a leading one, but if we are having such a difficult time with gas, what kind of luck are we going to have with coal?

Mr. MONTGOMERY. Coal surprisingly is a very clean product as compared to others we have. Probably the main issue on the environmental side will not be with the port, but will be with the problems the railroads will have, but we believe that those are and the railroads believe that they are going to be able to be solved. Those rights-of-way exist. It will not take an order to build a 25-million ton coal export facility in Long Beach, which we are moving ahead on right now, and additional trackage.

We have three rail lines that all serve the port of Long Beach, the Santa Fe, the Southern Pacific, the Union Pacific. There will be working agreements between them on how to use their trackage to the common facility in the best manner and it is quite conceivable that rail traffic will come in over one line and go out over the other. That will cut down on the amounts of individual traffic and unit trains on each individual line.

Senator MURKOWSKI. Does the port of Los Angeles or Long Beach have a coal loading facility of any consequence now?

Mr. MONTGOMERY. Both ports last year did approximately 3 million tons of coal.

Senator MURKOWSKI. Where did the coal go?

Mr. MONTGOMERY. Most of that was to Taiwan and Korea, some to Japan. We right now in the port of Long Beach are under construction on a second loader that will move our capacity by 1980, the end of 1981, to the start of 1983 to about 51/2 million tons, which will just about double the capacity we have and that is under construction at this time.

We then are also doing the environmental study and engineering study for a major terminal with a partnership which we formed with the Japanese, represented by CEO, the third largest trading company in Japan, and probably Maritime Corp. and Metropolitan Stevedore Co., Upland Industries, which is a subsidiary of Union Pacific Corp., who have the land in the port, and ourselves.

Senator MURKOWSKI. Do the Japanese come in for an equity participation?

Mr. MONTGOMERY. They may very well come in to an equity position in the terminal operation. That has not been decided. This group is doing the preliminary studies. At the conclusion of those there will then be an operator for the terminal selected. It is quite conceivable that the Japanese will be one of the partners in the terminal operation and it is quite conceivable that the project may very well be financed through Japanese financing.

Senator MURKOWSKI. And the coal will go to Japan.

Mr. MONTGOMERY. No, it will be a common terminal. They would just happen to be involved in the terminal operation, but it will not necessarily go to Japan.

Senator MURKOWSKI. Are there long-term contracts?

Mr. MONTGOMERY. There are not long-term contracts at this time. Again that is a chicken and egg situation. Do you get contracts and start building terminals?

Senator MURKOWSKI. It sounds like you are moving a little ahead of the scenario, because you are expanding the existing facility, which I assume does not have the same environmental roadblocks that are associated with planning a new market. Is that correct?

Mr. MONTGOMERY. That is correct.

Senator MURKOWSKI. Tell me, Mr. Burgess, in your study, can we expect an overview on the environmental realities of moving coal out of some of these western ports?

Mr. BURGESS. Yes. There will be an assessment of the environmental situation and constraints in that area and at the same time I think that was a matter of considerable discussion in the task force among the industry people and the State government people and others. And the bottom line is, I think, Mr. Chairman, that much depends on the site specific situations. It is very hard to generalize.

There are two issues there. One, you get into the differences from site to site, in air sheds and other physical characteristics. And the other situation is the skill of the developers. Those that are skillful may handle more difficult problems better than those who are less skillful handling easier problems. So much depends on site-by-site situations.

Senator MURKOWSKI. It would be interesting to ask some of our friends from the witness list that might be representative of their own countries in regard to how they assess the environmental exposure and whether they consider it a detriment to the ability of western coal to be marketed in the Pacific rim.

Mr. MONTGOMERY. I might just comment, Mr. Chairman, that that is a mutual problem. The Japanese are having serious environmental problems right now as we do. So it is not a one side of the ocean problem. It is going to have to be solved on both sides of the rim.

Senator MURKOWSKI. Tell me, Mr. Burgess, I could not help but note your reference to the Alaskan Railroad being part of the group of railroads that were studied to determine the capability and capacity and so forth, but I was kind of surprised to see the omission of any Alaskan ports in your port study and I would assume that a railroad would correspond with a port and consequently with a port study.

Mr. **Burgess**. Yes, I should have mentioned the Port of Seward. They are included in the port inventory.

Senator **Murkowski**. Thank you. I am glad that I refreshed your memory. Do you have any opinion on the application of slurry pipelines? You mentioned that there might be technology developing in moving coal in a sausage form within a pipeline. And I assume that there would be something gained by that, but I am not sure what vis-a-vis moving it with the water slurry, which I assume is what you would move the coal sausage.

Mr. **Burgess**. I think I would say that as a result of the work that we have done over the last 9 months with industry people that one thing stands out above all and that is everybody involved in inland transportation, railroads and pipeline people particularly are all looking at new innovations that can reduce costs.

And in the pipeline area, I think there is a continued interest among many and in conventional water slurries, there have been some changes in attitudes of some State governments on that issue, particularly in South Dakota and so clearly one has to see slurries as continuing possibilities.

In addition there is increasing interest in what are sometimes called nonwater slurries. Many of them use large amounts of water but in different forms, but especially methanol and ethanol slurries. And much work remains to be done on those and there are some doubts as to whether those would ever be cost effective.

The new interest in so-called capsule pipelines, they are not really slurries, because the coal is never mixed with the water, has a number of advantages on the cost side and there is a very keen interest on the part of many coal producers in what the capsule pipeline possibility might offer.

Senator **Murkowski**. Do you feel that coal slurries should be, particularly as it were considering the movement of western coal, protected as common carriers under legislation that would provide and authorize for control and regulations that the pipelines moving across a number of States, as being the most logical to the problem of trying to build a——

Mr. **Burgess**. I think that is one of the key questions and I think it is very difficult to give a yes or no answer to that.

Senator **Murkowski**. You would just identify it then as a key question?

Mr. **Burgess**. Well, I think it is one where all the parties involved have to work out their position on that and I think if we look at the last 7 or 8 years, many people would have liked to have seen it worked out one way and others another way. But I think there has been a movement and I think that is the way that issue will get solved.

And I think that there is a keen interest in moving ahead with the question of alternatives on the part of a lot of people and those negotiations, I think, are going on every day. There is the whole question of a Federal responsibility versus State responsibility and water for various purposes in the West.

Water is the life blood of the West. So anytime water is an issue, it is an issue that goes to the core of what the West is all about.

Senator **Murkowski**. I thank you very much, Mr. Burgess and I thank you, Mr. Greene and Mr. Montgomery, for your testimony.

We are going to recess the hearing at this time for 15 minutes and Chairman Warner will reconvene. Thank you.

[Whereupon, there was a 15-minute recess taken.]

Senator **Warner** [presiding]. My apologies for all present and others concerned for the delay. As I said earlier it was my responsibility to participate in the hearing of the nuclear force hearing now going on to cover our talks in Geneva that were taken earlier this week.

Let us proceed now with Mark Minoru Tada, manager, raw materials division, Nippon Steel. I understand it is the largest steel company in the world.

STATEMENT OF MARK MINORU TADA, MANAGER, RAW MATERIALS DIVISION, NIPPON STEEL U.S.A., INC.

Mr. **Tada**. Thank you, Mr. Chairman. I appreciate this opportunity of appearing before you today to present the views of the Japanese steel industry on U.S. coal. I have three topics in this statement.

No. 1, share of U.S. coal. The total annual consumption of coking coal by the Japanese steel industry in the 1973-80 period was 60 to 70 million metric tons. You will find the share of each supply source in the attached figure 2. The United States has been the second largest supplier during this period, accounting for between 20 to 30 percent of total imported coal.

In 1980, the total purchase of U.S. metallurgical coal by the Japanese steel industry amounted to 20 million metric tons, about 30 percent of our total imported coal. We imported about 70 percent from the east coast, 25 from the gulf and 5 from the west coast.

No. 2, demand and supply of coking coal in the medium to long-term range. An estimation of crude steel production in the medium- to long-term range is currently under study. However, according to the recent tentative estimation made by the Japan Iron and Steel Federation, crude steel production in 1985 is estimated at 115 million metric tons, ranging from 110 to 119 million metric tons, and in 1990, 127 million metric tons in 1990, ranging again 118 to 132 million metric tons.

Based on these estimates, our requirements for coking coal might reach 72 million metric tons in 1985 and 79 million metric tons in 1990. In view of the increasing demand for coking coal, the Japanese steel industry has been studying new development projects for the production of coking coal in Canada and in Australia.

No. 3, our requests for U.S. coal. With regard to U.S. coal, we appreciate your cooperation to provide us with necessary metallurgical coal to produce steel product for a long time. We fully recognize that it is one of our important supply sources and we will continue to purchase U.S. coal for a certain substantial percentage of our requirements, provided that it is internationally competitive.

This recognition is based on the following points: One, U.S. coal has a flexibility of supply with a vast amount of coal reserves.

Two, a trade system based on private sectors has already been established.

Three, a long-term relationship has lasted for more than 30 years. However, I wish to point out that there are many obstacles to expanding coal trade between the United States and Japan. What I would like to emphasize here is the international competitiveness of U.S. coal prices. We evaluate the price of imported coal in terms of delivered price at the discharging port in Japan, namely, CIF basis.

The price of U.S. coal which Japanese steel industry regards as one of basic coal is higher than that of other basic coal such as Australian and Canadian coal by as much as U.S. $20 plus demurrage on a CIF basis. We think this price difference comes from several reasons.

First of all, the high cost of coal at the mine itself resulting from lower productivity. Second, the comparatively higher freight cost of railway transportation from mine mouth to loading port. Third, the enormous costs caused by extraordinary prolonged detention at the loading port. And, fourth, the relatively higher ocean freight cost to cover about 10,000 sea miles.

How can you recover your competitiveness? Here are some of the measures which we would like to see taken on the side of the United States. The first has to do with the productivity of coal mines. We must ask that you continue your efforts to minimize the considerable price difference that now exists by improving your productivity.

Next, it appears to us that railroads in the United States resort to freight rate adjustments too easily and too frequently. In 1978 inland railway freight rose 11.3 percent, in 1979 14.9 percent. In 1980 the increase was 14.6 percent in the case of haulage from Pocahontas areas.

As a consequence, rail freight rates for U.S. coals are much too high. For example, U.S. $15 per ton per 450 miles for U.S. east coast coals compared to U.S. $12.50 per ton per 700 miles for Canadian coals.

As for rail freight rates, we are very much concerned about the recent petition filed with the Interstate Commerce Commission by Norfolk & Western. The railroad companies propose that rail transportation of coal bound for export should be exempted from all ICC regulations, including rate regulation.

We strongly believe that an exemption is inappropriate and that foreign users of U.S. coal would be injured if it were granted. One significant cost of an exemption would be higher prices for U.S. coal on the world market. In the long run, this would lead to both a reduction in the amount of U.S. coal available for export and to higher world coal prices generally.

The third point. Last year the problem of extraordinary prolonged detention of vessels at the loading port was raised as a serious one due to insufficient capacity at the loading port.

Since then, there have been new developments on the part of the United States which utilize two different approaches to overcome this problem.

One development is an attempt to utilize the existing port facilities to their maximum efficiency. Examples are the transportation contract by N&W and preregistration by Chessie. Another development is a plan to carry out new port constructions, such as the North Carolina State Port and expansion of the capacity of existing port facilities, such as the McDuffie terminal in Mobile.

The Japanese steel industry had to pay about $100 million last year as demurrage and as a result, therefore, we are trying to purchase coal from demurrage free supply sources in the United States.

Here let me explain briefly the typical contract of FOB, free on board. Unlike coals from other parts of the world, U.S. coal on the east coast alone is being loaded under terms that place the entire burden of dispatch and demurrage costs on the user.

In recognition of what is generally accepted as a worldwide standard, we therefore ask that the principles of the FOB contract be applied to U.S. coals being shipped from the east as well. In other words, we ask that loading terms in the contract explicitly provide for the seller to assume full responsibility up to the point free on board, regardless of whether coals are from the East, the South or the West.

We have a strong interest in the development of loading facilities and are watching any changes in this situation very closely. While we continue to hope for greater progress, we greatly appreciate the considerable efforts on your side in attempting to materialize existing programs on the planning and study of new ports construction.

We would like to request your continuous efforts on the expansion and improvement of port capacity. In order to cope with the fourth item, the Japanese steel industry is making every effort by way of building energy saving vessels and by using larger sized vessels. But in order to use the larger sized vessels, it is necessary to improve facilities at the loading ports.

It is easier to understand the urgent need to expand your port capacity to handle colliers by examining the capability of loading and discharging ports throughout the world. For example, Australia, Canada and South Africa can accommodate 120,000 to 160,000 deadweight ton class carriers.

And a number of these ports have expansion programs underway to handle the growing export trade. Most discharging ports of Japanese steel mills have the ability to unload more than 120,000 deadweight tons as is shown in the attached map of Japanese steelworks.

On the other hand, the United States continues to move coal only in smaller vessels. It should be emphasized that improving port facilities alone is not sufficient, unless the improved ports are capable of accommodating the larger carriers.

This second aspect, the accommodation of larger carriers, is essential to insure the international competitiveness of U.S. coal.

In conclusion, abundant coal reserves in the United States can fully satisfy the increased demand for coal. And it is our hope that by insuring competitiveness in price and improved port facilities, U.S. coal can play a leading role in the world coal trade.

Thank you very much for your attention.

[The prepared statement of Mr. Tada follows:]

STATEMENT OF MINORU TADA, MANAGER, NIPPON STEEL U.S.A., INC.

Mr. Chairman and members of the Subcommittee, my name is Minoru Tada and I am currently stationed in the New York Office of Nippon Steel U.S.A., Inc, as manager of raw materials. I appreciate this opportunity of appearing before you today to present the views of the Japanese Steel Industry on U.S. coal.

1. SHARE OF U.S. COAL

The total annual consumption of coking coal by the Japanese Steel Industry in the 1973-1980 period was 60 to 70 million metric tons. (Figure 1). You will find the share of each supply source in the attached Figure 2. The United States has been the second largest supplier during this period, accounting for between 20 to 30 percent of total imported coal. In 1980, the total purchase of U.S. metallurgical coal by the Japanese steel industry amounted to 20 million metric tons, about 30% of our total imported coal. We imported about 70% from the East coast, 25% from the Gulf and 5% from the West coast.

2. DEMAND AND SUPPLY OF COKING COAL IN THE MEDIUM TO LONG TERM RANGE.

An estimation of crude steel production in the medium to long term range is currently under study. However, according to the recent "tentative estimation" made by the Japan Iron and Steel Federation, crude steel production in 1985 is estimated at 115 million metric tons (ranging from 110-119 M M/T) and in 1990, 127 M M/T (118-132 M M/T).

Based on these estimates, our requirements for coking coal might reach 72 M M/T in 1985 and 79 M M/T in 1990. In view of the increasing demand for coking coal, the Japanese steel industry has been studying new development projects for the production of coking coal in Canada and in Australia.

3. OUR REQUESTS FOR U.S.COAL

With regard to U.S. coal, we fully recognize that it is one of our important supply sources and we will continue to purchase U.S. coal for a certain substantial percentage of our requirements, provided that it is internationally competitive. This recognition is based on the following points :

1. U.S. coal has a flexibility of supply with a vast amount of coal reserves.
2. A trade system based on private sectors has already been established.
3. A long term relationship has lasted for more than 30 years.

However, I wish to point out that there are many obstacles to expanding coal trade between the U.S. and Japan. What I would like to emphasize here is the "International competitiveness of U.S. coal prices". We evaluate the price of imported coal in terms of delivered price at the discharging port in Japan, namely CIF Basis.

The price of U.S. coal, which Japanese steel industry regards as one of basic coal, is higher than that of other basic coal such as Australian and Canadian coal, by as much as US$20.00 plus demurrage on a CIF basis. We think this price difference comes from several reasons :

First of all, the high cost of coal at the mine itself, resulting from lower productivity. Second, the comparatively higher freight cost of railway transportation from mine to loading port. Third, the enormous costs caused by extraordinary prolonged detention at the loading port. And, Fourth, the relatively higher ocean freight cost to cover about 10,000 sea-miles.

How can you recover your competitiveness? Here are some of the measures which we would like to see taken on the side of the U.S. The first has to do with the productivity of coal mines. We must ask that you continue your efforts to minimize the considerable price difference that now exists by imporving your productivity.

Next, it appears to us that railroads in the United States resort to freight rate adjustments too easily and too frequently. In 1978 inland railway freight rose 11.3%, in 1979 14.9%. In 1980 the increase was 14.6% in the case of haulage from Pocahontas areas. As a consequence, rail freight rates for U.S. coals are much too high. (For example, US$15.00 per ton per 450 miles for U.S. East coast coals compared to US$12.50 per ton per 700 miles for Canadian coals.)

As for rail freight rates, we are very much concerned about the recent petition filed with the Interstate Commerce Commission by Norfolk and Western. The railroads propose that rail transportation of coal bound for export should be exempted from all ICC regulation, including rate regulation.

We strongly believe that an exemption is inappropriate, and that foreign users of U.S. coal would be injured if it were granted. One significant cost of an exemption would be higher prices for U.S. coal on the world market. In the long run, this would lead to both a reduction in the amount of U.S. coal available for export and to higher world coal prices generally.

The third point.
Last year the problem of extraordinary prolonged detention of vessels at the loading port was raised as a serious one due to insufficient capacity at the loading port.

Since then, there have been new developments on the part of the U.S, which utilize two different approaches to overcome this problem.

One development is an attempt to utilize the existing port facilities to their maximum efficiency. Examples are the "Transportation contract" by N&W and "Pre-Registration" by Chessie.

Another development is a plan to carry out new port constructions, such as the North Carolina state port and expansion of the capacity of existing port facilities, such as the Mcduffie Terminal.
The Japanese steel industry had to pay about 100 million dollars last year as demurrage and as a result, therefore, we are trying to purchase coal from "demurrage free" supply sources in the U.S.

Here, let me explain the typical contract terms of FOB, free on board. Unlike coals from other parts of the world--or, in fact, other parts of the U.S.--coals from mines on the east coast of the U.S. alone are being loaded under terms that place the entire burden of despatch and demurrage costs on the user. In recognition of what is generally accepted as a world-wide standard, we therefore ask that the principles of the FOB contract be applied to U.S. coals being shipped from the East, as well. In other words, we ask that loading terms in the contract explicitly provide for the seller to assume full responsibility up to the point "free on board," regardless of whether coals are from the East, the South or West.

We have a strong interest in the development of loading facilities and are watching any changes in this situation very closely. While we continue to hope for greater progress, we greatly appreciate the considerable efforts on your side in attempting to materialize existing programs on the planning and study of new ports construction.

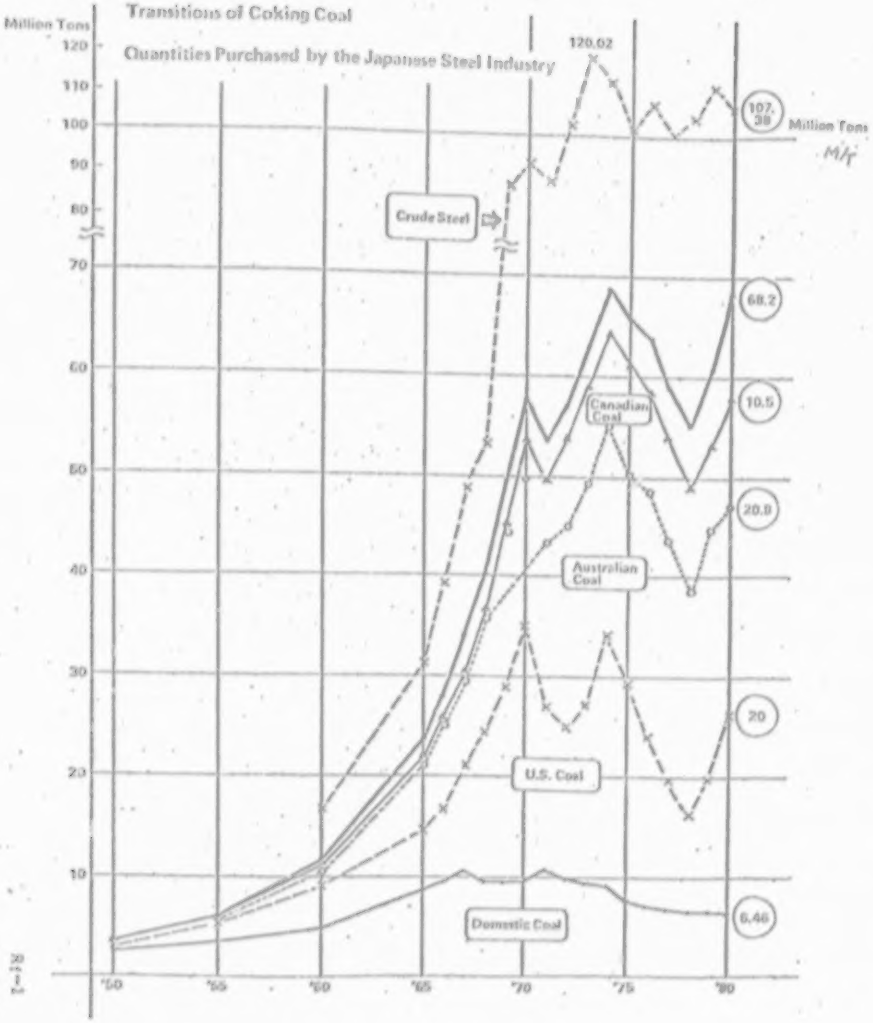
We would like to request your continuous efforts on the expansion and improvement of port capacity.
In order to cope with the fourth item, the Japanese steel industry is making every effort by way of building energy saving vessels and by using larger-sized vessels, but in order to use the larger-sized vessels, it is necessary to improve facilities at the loading ports.

It is easier to understand the urgent need to expand your port capacity to handle colliers by examining the capability of loading and discharging ports throughout the world. For example, Australia, Canada, and South Africa can accommodate 120,000 to 160,000 DWT-class carriers. And a number of these ports have expansion programs underway to handle the growing export trade. Most discharging ports of Japanese steel mills have the ability to unload more than 120,000 DWT, as is shown in the attached map of Japanese steelworks.
On the other hand, the United States continues to move coal only in smaller vessels. It should be emphasized that improving port facilities alone is not sufficient, unless the improved ports are capable of accommodating the larger carriers. This second aspect - the accommodation of larger carriers - is essential to insure the international competitiveness of U.S. Coal.

Abundant coal reserves in the U.S. can fully satisfy the increased demand for coal. And it is our hope that, by insuring competitiveness in price and improved port facilities, U.S. coal can play a leading role in the world coal trade.

Thank you very much for your attention.

- Figure 1 -

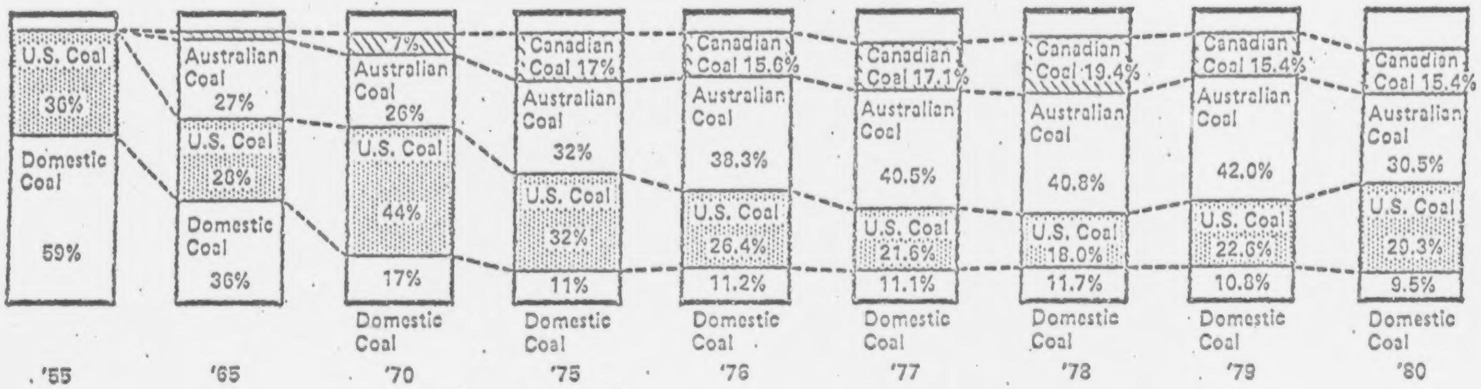


Transitions of Coking Coal

Quantities Purchased by the Japanese Steel Industry

- Figure 2 -

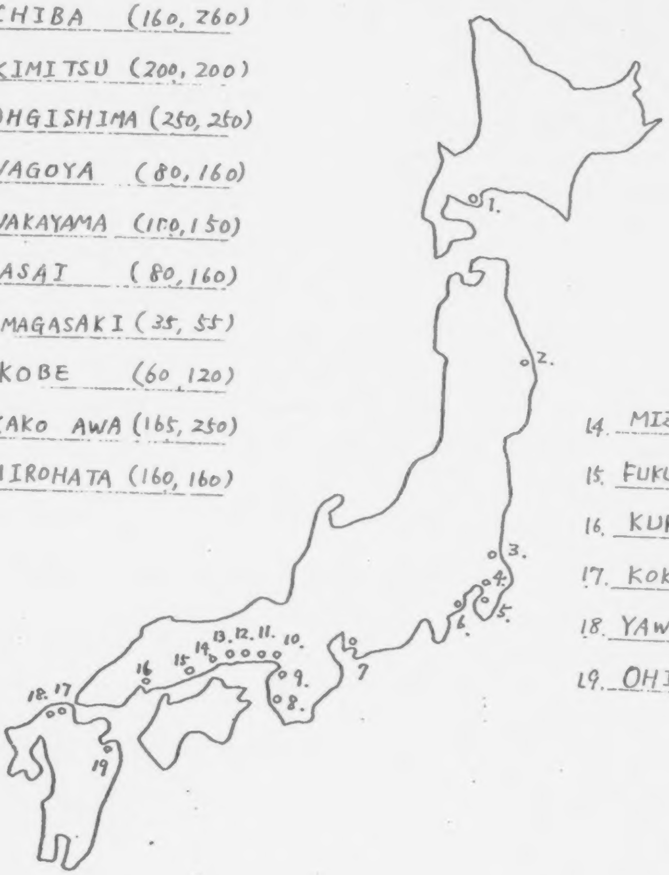
Transistions of the Shares of Countries in Coking Coal Quantities Purchased by the Japanese Steel Industry



Ports of Japanese Steel Works

maximum D.W.T. (160, 250)
↑ max draft 160.000 D.W.T.
↑ in case of second port

1. MURORAN (160, 160)
2. KAMAISHI (70, 120)
3. KASHIMA (180, 250)
4. CHIBA (160, 260)
5. KIMITSU (200, 200)
6. OHGISHIMA (250, 250)
7. NAGOYA (80, 160)
8. WAKAYAMA (150, 150)
9. SASAI (80, 160)
10. AMAGASAKI (35, 55)
11. KOBE (60, 120)
12. KAKO AWA (165, 250)
13. HIROHATA (160, 160)



14. MIZUSHIMA (160, 230)
15. FUKUYAMA (200, 200)
16. KURE (150, 150)
17. KOKURA (90, 125)
18. YAWATA (160, 250)
19. OHITA (300, 300)

Senator WARNER. Thank you very much. What is the percentage of long term contracts compared to spot contracts for Nippon Steel?

Mr. TADA. In defining long term contracts over a period of 1 year, as far as Nippon Steel is concerned, we are fully covered at the beginning of the fiscal year, which in Japan begins in April. As for spot coal by one vessel, business of 50,000 to 60,000 tons is very rare in our case.

As for long term contracts over 5 or 10 years with U.S. suppliers, we have covered a substantial percentage. I do not have the exact figures at this moment, but most of the coal comes under the long term contract.

Senator WARNER. I don't mean to press into your private corporate affairs. Can you give us any estimate of what percentage of your coal needs are under long term contracts?

Mr. TADA. In terms of, say, 5 years or 10 years?

Senator WARNER. Yes, let us take 5.

Mr. TADA. Five years. My guess is 50 percent, 50 to 60 percent.

Senator WARNER. For a new seller then of coal to Nippon Steel, how long would it take to approve the sale and what procedures would have to be undertaken to firm up this contract?

Mr. TADA. We assume that the suppliers know what specifications we are looking for, that is, the type of coal used as coking coal, metallurgical coal. At conferences, I myself have mentioned a type of coal we call the high fluidity, high volatile type, which is vital to us and can be obtained from the United States.

Those who have assurance of this type of coal inform us either directly or through our friends, trading companies who are communicating with us, between the suppliers and the end users. It takes more than 1 year to my best estimation before any serious negotiation is undertaken.

Because we have to check the quality and the mines, productivity, transportation, loading facility and management, everything, we sometimes send engineer people to the mine to meet their people ask them to go to Japan and meet our people. So it takes quite a while to establish a contract.

Senator WARNER. All right, port legislation now pending here in the Congress have varying provisions in it concerning user fees. As a worldwide buyer of coal and hopefully a potentially greater buyer from the United States, how do you approach the concept of user fees?

Mr. TADA. Our basic stance is from the mine mouth to the loading port is the responsibility of the suppliers, including the productivity of the mines, inland transportation, loading facilities, including the size of the vessels which can be accommodated at the loading facilities.

The concept of the user fee will be included in the total picture, total frame of competitiveness on the basis of CIF, discharge in port of Japan. Therefore, if the concept implies a total amount of charge, that is, the port charge in the name of user fee, then it will affect the total competitiveness of your coal.

We cannot estimate at this moment whether we are in favor of the user fee concept. We have to judge from the total frame of international competitiveness of your coal.

Senator WARNER. A very clear answer to a tough question. It will be debated on the floor at some length here shortly. Thank you very much for your valuable contribution that will be studied here by the United States Senate.

We will now hear from Mr. Shibukawa, chief representative, Kansai Electric Power, Inc. It is my understanding that this witness will be speaking for a very large electric utility in Japan and the Japanese industrial coal.

Thank you for joining us today.

STATEMENT OF KAZUO SHIBUKAWA, CHIEF REPRESENTATIVE, KANSAI ELECTRIC POWER, INC.

Mr. SHIBUKAWA. Mr. Chairman and members of the subcommittee, my name is Kazuo Shibukawa. I am the head of the New York office of the Kansai Electric Power Company, Inc. I am deeply honored to be given this opportunity to express the views of the major steam coal users in Japan, which were arranged by the Federation of Electric Power Companies.

I would like, first of all, to describe the general coal supply and demand situation in Japan. In 1973, the year of the first oil crisis, the total steam coal demand in our country was no more than 12 million tons a year supplied mostly from domestic coal mines and 7 to 8 million tons of this total were consumed by the electric utilities industry.

The sharp oil price escalation triggered by the oil crisis and the subsequent instability in the supply of oil had a very heavy impact on Japan, because the greater part of its domestic energy requirements had until then been satisfied with imported oil.

This induced the Japanese Government and relevant industries to strive to establish a new postpetroleum energy supply system by developing substitute energy sources such as nuclear power, liquefied natural gas and coal, enforcing new energy-related policies and encouraging the development of energy saving technologies.

Subsequently coal has been used increasingly to take the place of oil in many industrial areas. The cement industry has been particularly positive in introducing overseas coal for its operation, partly because oil-to-coal conversion is easier for it than for other industries. Having already attained a conversion rate of about 90 percent, the cement industry now consumes about 8 million tons of imported coal a year.

In the electric utilities industry, however, coal-fired power generation which uses a large amount of imported coal has been started only recently, because a considerably long lead time is required to build new powerplants that satisfy the stringent environmental standards and to prepare cinder dumping sites and harbor facilities.

At present we have a total of 40 coal-fired power units with a total output of 5,760 megawatts. To run these plants, the electric utilities are expected to consume 9 million tons of domestic coal and 3 million tons of imported coal this year.

The industry is planning to build 49 new coal-fired units with a total output of 24,000 megawatts in the coming 10 years, including those oil-fired units to be converted into coal-fired units. If these units are all constructed as scheduled, the coal demand of the electric utilities industry will exceed 50 million tons in 1990.

Since there is little likelihood of Japanese coal production rising beyond the present level, the industry will have to import about 40 to 46 million tons of coal from overseas in 1990.

The coal demand in industrial sectors other than cement and electric utilities is not very heavy and is expected to show a rather limited and gradual increase in the future. Thus, it is estimated that the Japanese end users, mainly comprised of the cement industry and the electric utilities industry, will have to import a total of more than 60 million tons of coal in 1990. This is considerably greater than the 1979 government estimate of 53.5 million tons.

These figures are extracted from existing forecasts. And as these programs are now being revised by each sector, I must emphasize that the above figures should be understood as being flexible.

There are a number of points which should be given special consideration to insure that the Japanese end users will be able to secure such voluminous overseas coal procurement. First, stability of supply with a reasonable price must be insured.

In introducing coal as one of the main petroleum substitute fuels, the electric utilities industry, in particular, must be assured of a smooth and a stable coal supply because it is legally obliged to satisfy the growing national power demand.

Second, infrastructural improvement must be made in both producing countries and Japan to provide the basis for efficient and smooth coal transportation to the end users. In Japan, harbors of some power stations are to be improved for direct receiving of steam coal. Coal receiving and distributing facilities, such as coal centers and public wharves, are also being planned for smooth coal supply to powerplants not accessible by large coal carriers and to relatively small users in the cement and other industries.

Third, coal utilization technology must be developed. Owing to its small national land area, the Japanese Government has enforced very stringent rules for environmental protection, which include many regulations on the use of coal.

For this reason, strenuous efforts are being made to develop the technologies needed in increasing coal consumption without causing environmental contamination, methods for disposing of the growing quantity of cinders, a system of using coal by coal oil mixture, COM, and new technologies promoting coal gasification and liquefaction.

Fourth, the difficulty in securing locations for coal-fired power stations should be pointed out. Because of the public's image of coal as being dirtier than oil, it is harder to obtain a site for a coal power station.

Therefore, the local inhabitants in any new plant areas will have to be convinced of the importance of coal as one of the main petroleum substitute fuels and the electric utilities industry must gain national cooperation in constructing coal power stations. This is a decisive factor in the successful attainment of the coal-fired power station plan I have already mentioned.

Now, I would like to explain the desires and expectations of Japanese end users regarding American steam coal. First, I would like to point out that owing to the long distances involved in inland transportation, the American coal delivered to Japan is the highest in price or to be exact, it incurs the highest CIF at Japanese ports.

When American coal achieves price competitiveness in the international coal trade by improving the inland transportation system and facilities and its quality is guaranteed to the satisfaction of Japanese end users, I am sure that the great latent demand for American coal will be actualized in Japan.

As we are trying to diversify the sources of overseas coal supply, full-fledged development of American coal is more than desirable and earnestly hoped for.

The United States-Japan joint research for western coal development, which is being conducted by the Coal Export Task Force of WESTPO, the consultative organ of western governors and the Japanese end users, is quite meaningful in that it has served and will serve to solve various development problems including those I have just mentioned. Such joint meetings and research should continue to be promoted by both countries.

Our second expectation pertains to the pricing system. We are hoping that the price of American coal will be stabilized over a long period of time on the basis of production cost plus a reasonable profit, as this will undoubtedly contribute to the establishment of a strong and lasting supplier-user relationship between your country and ours.

Our third expectation is for the stability of supply. We in the Japanese electric utilities industry are ready to positively participate in your coal development schemes by making equity investment, if necessary, for the purpose of insuring stable, long term coal procurement from your country.

Strikes staged by workers in the coal mining and related industries cut off the supply of coal and result in heavy loss to end users. We hope that every endeavor will be made to avert strikes.

I have described the expectations and desires entertained by Japanese end users regarding American coal. I earnestly hope that the coal exports from your country to ours will increase rapidly in the future through our joint efforts to solve all outstanding problems.

Thank you very much for your kind attention.

[The prepared statement of Mr. Shibukawa follows:]

STATEMENT OF KAZUO SHIBUKAWA, CHIEF REPRESENTATIVE, KANSAI ELECTRIC POWER, INC.

Mr. Chairman and Members of the Subcommittee

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Fourth, the difficulty in securing locations for coal-fired power stations should be pointed out. Because of the public's image of coal as being dirtier than oil, it is harder to obtain a site for a coal power station. Therefore, the local inhabitants in any new plant areas will have to be convinced of the importance of coal as one of the main petroleum substitute fuels, and the electric utilities industry must gain national cooperation in constructing coal power stations. This is a decisive factor in the successful attainment of the coal-fired power station plan I have already mentioned.

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First, I would like to point out that owing to the long distances involved in inland transportation, the American coal delivered to Japan is the highest in price, or to be exact, it incurs the highest CIF at Japanese ports. When American coal achieves price competitiveness in the international coal trade by improving the inland transportation system and facilities, and its quality is guaranteed to the satisfaction of Japanese end users, I am sure that the great latent demand for American coal will be actualized in Japan. As we are trying to diversify the sources of overseas coal supply, full-fledged development of American coal is more than desirable and earnestly hoped for.

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I have described the expectations and desires entertained by Japanese end users regarding American coal. I earnestly hope that the coal exports from your country to ours will increase rapidly in the future through our joint efforts to solve all outstanding problems.

Thank you very much for your kind attention.

Table 1. Long-Term Forecast of Primary Energy Supply and Demand

Fiscal Year	1977 (Actual)		1985 (Estimate)		1990 (Estimate)		1995 (Estimate)	
Energy Demand (million kl oil equivalent)								
Demand without conservation			662		822		973	
Rate of conservation (%)			12.1		14.8		17.1	
Demand with conservation	412		582		700		807	
Energy Supply								
Hydro Power Natural flow (MW)	18,100	4.8%	22,000	4.7%	26,000	4.6%	30,000	4.6%
Hydro Power Pumped storage (MW)	8,050		19,500		27,000		33,500	
Geothermal Energy (million kl)	0.15	0.0	2.20	0.4	7.30	1.0	14.20	1.8
Domestic Oil & Natural Gas (million kl)	3.79	0.9	8.00	1.4	9.50	1.4	14.00	1.7
Domestic Coal (million ton)	19.72	3.2	20.00	2.5	20.00	2.0	20.00	1.8
Nuclear Power (MW)	8,000	2.0	30,000	6.7	53,000	10.9	78,000	14.3
Imported Coal (million ton)	58.29	11.6	101.00	13.6	143.50	15.6	178.00	16.5
[of which: Steaming Coal]	[0.95]		[22.00]		[53.50]		[80.50]	
L.N.G. (million ton)	8.39	2.9	29.00	7.2	45.00	9.0	50.00	8.7
New Fuel Oil, Exotic Energy, etc. (million kl)	0.31	0.1	5.20	0.9	38.50	5.5	61.00	7.6
Total (million kl oil equiv.)	105	25.5	216	37.1	350	50.0	459	56.9
Imported Oil (million kl)	307	74.5	366	62.9	366(350)	50.0	366(348)	43.1
[of which: L.P.G. (million ton)]	[7.39]		[20.00]		[26.00]		[33.00]	
Total Supplies (million kl oil equiv.)	412	100.0	582	100.0	716(700)	100.0	825(807)	100.0
Supply-Demand (million kl oil equivalent)	--		--		16		18	

Note: 1. Oil equivalent; 9,400 kcal/l. The rate of conservation is based on a "total primary energy/GNP" elasticity relationship in 1973 f.y.

2. Geothermal Energy includes geothermal generation, outputs of which are 80MW in 1977 f.y., 1,000MW in 1985 f.y., 3,550MW in 1990 f.y., 7,000MW in 1995 f.y.

3. "New Fuel Oil, Exotic Energy, etc." include coal liquids, oil sand, shale oil, alcohol fuel, solar energy and fire wood and charcoal.

4. The distribution ratios of imported oil in fiscal 1990 and 1995, are based on the parenthasized figures.

Table 2. Forecast of Generating Capacity by Type

(1,000KW)

As of the end of Fiscal Year	1980		1985		1990	
Nuclear	15,510	(12.0%)	27,880	(15.8%)	50,920	(21.7%)
Hydroelectric	28,670	(22.2)	38,170	(21.7)	45,710	(19.5)
Ordinary	17,850	(13.8)	19,370	(11.0)	21,320	(9.1)
Pumped Storage	10,810	(8.4)	18,800	(10.7)	24,390	(10.4)
Thermal	85,180	(65.8)	110,320	(62.5)	137,930	(58.8)
Coal	5,260	(4.1)	12,500	(7.1)	29,560	(12.6)
LNG	19,710	(15.2)	32,390	(18.4)	45,960	(19.6)
LPG	600	(0.5)	2,700	(1.5)	4,700	(2.0)
Geothermal	130	(0.1)	400	(0.2)	1,380	(0.6)
Oil	59,480	(46.0)	62,330	(35.3)	56,330	(24.0)
Total	129,360	(100)	176,370	(100)	234,560	(100)

Senator **Warner**. Thank you very much. One question. You talked about technology. The testimony received today has indicated that slurry is one method of reducing the cost of transportation of coal to the Pacific rim countries. However, for a slurry pipeline to be effective there must be at the off-loading facilities of the slurry product comparable, technical means to off-load as well as customers to use the product, which is as you well know somewhat unique.

My question is are the Japanese utility users currently exploring the feasibility of financing the needed development of coal slurry transportation as well as utilization of the product?

In other words, it seems to me that there is a twofold problem, one, getting it off the vessels; and second, adaption of the boilers and so forth to utilize the slurry product.

If the witness desires, we can have that response submitted for the record.

Interpreter. If I may, I would like to answer, interpret it, to translate it.

Senator **Warner**. Perfectly acceptable.

Interpreter. They are examining the use of slurried coal at this time.

Senator **Warner**. That would be perfectly acceptable and I thank you very much and may I again thank you for your very informative observations as a complement toward this study. Thank you.

Our remaining witness today is Mr. A. E. Michon, vice president, International Burlington Northern, Inc., Portland, Oreg.

STATEMENT OF ALFRED E. MICHON, VICE PRESIDENT, INTERNATIONAL BURLINGTON NORTHERN, INC., PORTLAND, OREG.

Mr. **Michon**. Good afternoon, sir. I am Ted Michon, vice president for International Burlington Northern, Inc. My office is in Portland, Oreg. And my duties include coordinating the activities of our eight subsidiary companies as they relate to international commerce.

I assumed this position on April 1, 1981 and since that time I have been actively involved in efforts to export coal to Pacific rim countries via the Pacific Northwest ports.

Burlington Northern is a transportation and a natural resource company. With the merger of the BN and Frisco last year, our railroad is now the longest in the Nation, 29,000 miles long. We serve 25 States and two Canadian provinces. We stretch from the Gulf of Mexico to the Great Lakes to the Pacific Ocean.

Our railroad is positioned to play an increasingly important role in the development of coal exports. BN also has a major position in the coal reserves of this nation. To a limited extent, coal is now mined on our lands. But our primary involvement in the coal trade has been and will continue to remain in the moving of coal.

The transportation of coal has become BN's largest single source of revenue. In 1980 coal revenues rose to $945 million or 29 percent of our total gross freight revenues. In that year we have originated 100 million tons of coal making BN the largest carrier of western coal and the second largest carrier of coal in the United States.

Large-scale movement of coal, however, is a recent development in our history. In 1970, for example, we only moved 17 million tons.

The Powder River basin, located in northeast Wyoming and southeast Montana, is the primary source of the coal that we have transported. This region offers the greatest long term export potential to the Pacific rim. Today there are 19 mines operating in the Powder River basin and 10 of these are the largest mines in the United States.

From the Powder River basin BN unit coal trains fan out to utility customers in 18 States throughout the Midwest, South, North Central and Northeast areas of our country. The Powder River basin is characterized by thick seams of coal ranging from 50 to 135 feet thick of pure coal, which are rather flat lying and generally between 50 and 100 feet of the surface.

The significance of this is that it represents an extremely large, reliable and cheaply mined source of a reliable quality of coal. The coal itself ranges in quality between 8,200 and 9,700 Btu's per pound and it is extremely low in sulfur content, generally less than half of 1 percent.

It is low in ash content and as you can see with the movement of over 100 million tons in 1 year it has been very attractive to the utilities in the United States. Significant investments have been made by BN to support this tremendous growth in business. Typical of this is the construction and completion of our new 127-mile route, connecting Gillette with Orin and Wyoming at a cost of $110 million. Incidentally this is some of the only new rail construction in this country since before the Depression.

The purpose of this investment and much others has been to perfect the logistics and transportation system that is characterized by the unit train.

Senator WARNER. Which depression are you referring to?

Mr. MICHON. Sir, the old one, the one in the 1930s.

Senator WARNER. That is a rather startling comment. I was not aware of that. Excuse the interruption.

Mr. MICHON. That is all right. As you know the railroad industry has not been earning attractive returns to warrant that kind of investment in the past.

One of the typical characteristics of the unit train is the cycle time which means the time it goes from the mine to the utility and returns. Today our average cycle time, because of that kind of investment, is now 5.6 days and this is a 26 percent improvement over what it was before we built that new railroad.

The result of all of our coal related investments has been greater productivity and incidentally to date that investment has been over 1.1 billion and will escalate another half a billion or so before we are done. What we have gotten for that money is the unit train system that I described.

Unit trains exhibit almost twice the gross ton miles per train hour than a regular freight train does. The average number of horsepower, for example, per ton of coal moved was only 1.43 last year versus 2.2 for our regular freight train.

In terms of cars per train, coal trains average 106, whereas regular trains averaged only 67. And incidentally our standard unit train is really designed to move 110 cars and the reason for the difference is that we have a few that are operating in a territory that cannot handle that.

Now, as to our forecast for coal exports, I don't think that I should repeat what has been mentioned by previous witnesses that are experts in that field and we generally concur with their comments.

I think the bottom line though as far as the BN and the Powder River basin is what do we expect to move as our market share of the forecast as you have heard this morning. And as a result of our study and interviews overseas, we think that by 1990 we will share to the tune of 5 to 10 million tons of Powder River coal.

This is the equivalent of three to six trains per day and it is certainly nothing that we cannot handle and nothing that would belie the infrastructure in place. By 1995 we are hoping that this 5 to 10 million will escalate to 12 to 19 million or in the order of 7 to 11 trains per day.

In my various trips to the Far East dealing with the export of coal one of the most startling experiences I had was to be confronted with the idea in the orient that today in the Pacific Northwest and in the Powder River basin there does not exist a proper infrastructure to support exports of the type as I just mentioned.

I have spent a great deal of time trying to put that concern to rest, because it simply is not a fact. Today the Burlington Northern has a perfectly adequate coal transportation network and system from the Powder River basin to all of the potential coal exporting sites in the Pacific Northwest. And if you will, I would like to briefly describe what those routes are.

The course is of commonwealth until we get to the city of Spokane, Wash. and from there we have a choice of four possible routes, depending on which port site would be served. Probably the cheapest route that we follow is along the Columbia River and this is because that is the water level river route. It is characterized by a high capacity railroad which is relatively underused today.

It can absorb great tonnages of traffic and certainly can absorb the coal business. Because of its water level, we avoid the problems of heavy grade and high curvature in the mountains, which characterize the other three routes.

They are namely, working northward, the Stampede route, which is the old line of the main line of the Northern Pacific and that is followed by the Snoqualmie route which is formerly the route of the Milwaukee Road, which BN purchased for the purpose of having the route in the future if our business should extend enough so that we need it.

Incidentally that is the easiest route to cross the Cascade Mountains on. It has curvature that is only limited in two places and only a half of 1 percent grade. It does need a great deal of investment and upgrading, however, if it were to qualify for unit train operation.

The fourth route is the Stevens Pass route which utilizes the Cascade tunnel and is the former main line of the Great Northern. It has a rather steep grade at one point, but we think it is certainly suitable for unit train operation.

Now, if I may, I would like to depart a little from my written submission and make some comments on what has come to mind throughout the hearing this morning as a result of what other witnesses have mentioned.

First of all, I would like to talk about marketing to Japan, Korea, and Taiwan. I would hate for the impression to be left here that the U.S. companies, whether they be railroads or mines, are not engaging in an active and aggressive program in marketing our western coal to these countries.

The fact is that we are. For example, I myself have made four trips over there for this purpose since April and I am going again next month. Just 3 weeks ago we hosted a major delegation of the Japanese coal mining interest to the United States to show them our infrastructure, to show them our mines and to show them our port sites and to detail to them the investments and the dualability of putting together a logistics system that would support their demand.

So I think the marketing effort has been very aggressive and is ongoing and I personally believe it will be fruitful.

As far as the Staggers Act and the contract with unit trains, I would simply like to reemphasize what Mr. Burgess said, this has given us a tool to put together the financially secure and reliable, long-term transportation arrangement so that the railroad can secure its investment and the shipper can be sure that he has adequate and guaranteed transportation through the life of his contract.

This is extremely important to the utilities especially when you think that their supply line is thousands and thousands of miles long over two oceans, over one ocean, rather, and two mountain ranges.

The third point I would like to make about the slurry pipeline is that, simply that I think in the long run whether or not these play a role in the exportation of coal is a question of economics. To date the economics have not been compelling enough to bring forth this type of investment and looking at only very gross numbers, I would have to wonder if it will ever happen.

Regardless of what slurry pipelines you are thinking about the cost always seems to come up in the order of $2 to $3 billion. That will provide a pipeline that can transport 25 million tons of coal a year.

As I mentioned to you earlier our total investment in our coal logistics system will ultimately come to $1.7 million and that will provide a system that can handle 145 million tons a year to many customers. So on those gross numbers I would have to wonder whether the economics will ever prove compelling.

The third point I would like to make is on——

Senator **Warner**. Excuse me, I would like to put side-by-side in the record those two figures. You are saying the railroad complex can transport x tons.

Mr. **Michon**. 145, yes.

Senator **Warner**. And by what coal slurry could you anticipate the transport?

Mr. **Michon**. Twenty-five.

Senator **Warner**. And that is just one coal slurry and one railroad.

Mr. MICHON. Well, one railroad system. It extends all over the United States, rather than just one point to point.

On the matter of user fees, of course, you know the railroads have always been for these. But I think the more important and urgent thing is that the matter be settled one way or the other. There are a lot of people who want to get on with the matter of exporting coal to the orient. And until this question is settled, there are going to be major questions about where to make investments. Regardless of what way it goes, I think that the trade will get on with it but we cannot really get moving until it is settled. So I would only urge that we try to get it settled.

Another point I would like to make about the way in which we are trying to develop this trade and that has to do with what was just mentioned by the previous witness. There is a great desire in Japan on the part of the utilities, in fact throughout the whole Far East for what I would call real price stability, reliability, and stability.

They want the sellers of both transportation and coal to build in a fair rate of return into their pricing structure so they can make a capital investment that is required, but they also want reliability throughout the life of their plant that those coal rates will not escalate with the price of oil and the price of gas and some other energy related opportunity.

And this is the kind of contract that I find the producers in the Powder River basin as well as in my company would like to put together, so that the real price is protected by escalation clauses that reflect genuine increases in the cost due to inflation and preserve the basic real price and real margin.

Our company under Richard Bressler, our president and CEO, has made a major commitment to develop international trade through Pacific northwest ports. The development of coal exports is a matter of top priority for us. We have committed over $1.2 million to six different studies with various ports, coal producers, and coal consumers.

We hope this seed money will help to solve some of the engineering and environmental problems which might otherwise delay this port development. While we are strongly in favor of further port development, in the northwest and elsewhere, I want to stress one point to you. Burlington Northern will not play favorites among ports. We believe that economics and economics alone should dictate where that growth occurs.

In summary, BN has analyzed the demand for coal and other export traffic through 1995 and has developed detailed estimates of the track capacities and investments necessary to carry this track. We have also determined the types and quantities of equipment necessary to meet this demand and we find that it is all dual.

The cost of these improvements are manageable and the work can be completed before the movements commence. BN's experience during the past decade in gearing up to to serve the domestic steam coal market adds credence to planning estimates for meeting this export challenge.

I appreciate being invited here today to express these thoughts.

[The prepared statement of Mr. Michon follows:]

STATEMENT OF ALFRED E. MICHON, VICE PRESIDENT-INTERNATIONAL, BURLINGTON NORTHERN INC.

I AM ALFRED E. MICHON, VICE PRESIDENT-INTERNATIONAL FOR BURLINGTON NORTHERN INC. MY OFFICE IS LOCATED IN PORTLAND, OREGON. I WORK FOR THE HOLDING COMPANY AND MY DUTIES INCLUDE CO-ORDINATING THE ACTIVITIES OF OUR EIGHT SUBSIDIARY COMPANIES AS THEY RELATE TO INTERNATIONAL COMMERCE -- AN INCREASINGLY IMPORTANT ASPECT OF THE OVERALL BUSINESS OF OUR COMPANY.

I ASSUMED THIS POSITION ON APRIL 1, 1981 AND, SINCE THAT TIME, I HAVE BEEN ACTIVELY INVOLVED IN EFFORTS TO EXPORT COAL TO PACIFIC RIM COUNTRIES VIA WEST COAST PORTS.

PERHAPS MY BIGGEST CONTRIBUTION TO THE CAUSE TODAY WILL BE TO PUT OUR INVOLVEMENT INTO PERSPECTIVE. BURLINGTON NORTHERN IS A TRANSPORTATION AND A NATURAL RESOURCE COMPANY. WITH THE MERGER OF THE BN AND THE ST. LOUIS-SAN FRANCISCO RAILWAY LAST YEAR, OUR RAILROAD IS NOW THE LONGEST IN THE NATION -- 29,000 MILES LONG. WE SERVE 25 STATES AND 2 CANADIAN PROVINCES, STRETCHING FROM THE GULF OF MEXICO TO THE GREAT LAKES TO THE PACIFIC OCEAN. OUR RAILROAD IS POSITIONED TO PLAY AN INCREASINGLY IMPORTANT ROLE IN THE DEVELOPMENT OF COAL EXPORTS. BN ALSO HAS A MAJOR POSITION IN THE COAL RESERVES OF THIS NATION. TO A LIMITED EXTENT, COAL IS MINED ON OUR LANDS. BUT, OUR PRIMARY INVOLVEMENT IN THE COAL TRADE HAS BEEN IN MOVING COAL.

GROWTH AND INVESTMENTS IN COAL

THE TRANSPORTATION OF COAL HAS BECOME BURLINGTON NORTHERN'S LARGEST SINGLE SOURCE OF REVENUE. IN 1980, COAL REVENUES ROSE TO $945 MILLION OR 29% OF TOTAL GROSS FREIGHT REVENUES. BN ORIGINATED MORE THAN 100 MILLION TONS OF COAL LAST YEAR, MAKING BN THE LARGEST CARRIER OF WESTERN COAL AND THE SECOND LARGEST CARRIER OF COAL NATIONWIDE. LARGE-SCALE MOVEMENT OF COAL, HOWEVER, IS A RECENT development in BN's history (Table I). In 1970, for example, BN originated only 17 million tons of coal.

The Powder River Basin (PRB), located in northeast Wyoming and southeast Montana, is the primary source of coal transported by BN (Figure 1). This region offers the greatest long-term export potential. Nineteen mines are currently operating in the PRB, including 10 of the 20 largest mines in the US. From the PRB, BN unit coal trains fan out to utility customers in 18 states throughout the Midwest, South, North Central, and Northwest areas of our country.

The PRB is characterized by thick seams, ranging from 50 to 135 feet, which are flat lying and generally within 100 feet of the surface. This allows the coal to be recovered by surface mining, an operation that is more cost efficient and inflation resistant than underground mining. Strippable reserves of subbituminous coal in the PRB are estimated at 58 billion tons or 37% of the total surface mineable coal reserves in the US. The quality of the fuel ranges from 8200-9700 BTU/lb. (4555-5390 Kcal/Kg), is low in sulfur and moderate in ash contents. This combination of favorable mining conditions and fairly good quality coal has attracted massive investments by the largest energy companies in the US, including Exxon, Mobil, Shell, ARCO and NERCO.

Significant coal-related investments have also been made by BN in the PRB and throughout the BN system. Certainly the most visible of these investments is the completion two years ago of the Gillette-Orin line. This new 127-mile route cost approximately $110 million and has enabled BN to greatly improve unit train efficiency.

In fact, unit train cycle time now averages 5.6 days, a 26% or two-day improvement from the days before the opening of the new line. Roadway improvements since 1976 include replacing 2,300 miles of rail, installing 11 million ties, and thousands of tons of ballast, and miles of electronic centralized traffic control signal systems. In total, approximately $520 million of roadway capital expenditures directly attributable to coal-related improvements were made between 1976-1980.

Furthermore, during the last five years BN acquired by lease and purchase 752 locomotives for coal service and more than 2,800 coal cars. These items cost $590 million including the original cost of equipment leased. To the east of the PRB, on the mainline to the Midwest, BN constructed new mechanical facilities to insure efficient operation of unit coal trains. This facility, located at Alliance, Nebraska, cost $47 million and can service or repair up to 70 cars and 150 locomotives per day.

The result of these coal-related investments is high productivity. In 1980, BN's unit coal trains exhibited almost twice the gross ton miles per train hour than regular freight trains. The average number of horsepower per ton of coal was only 1.43 vs. 2.2 for regular freight. In terms of cars per train, unit coal trains averaged 106, whereas regular freight averaged only 67 in 1980. Clearly, BN's unit trains transport cargo far more efficiently than standard freight service.

Overall, BN investments for coal transportation have exceeded $1.1 billion since 1976. An additional $425 million will be spent through 1984 to further increase productivity and capacity.

Forecast for Coal Exports

The shift away from dependence on imported oil by Japan, Taiwan, South Korea and other Far East countries has provided an opportunity for producers of US Western coal to enter the international steam coal business. Based on discussion with Far East steam coal consumers and a review of the available forecasts, we estimate that the demand for imported steam coal in the Pacific Rim will grow from 60 million short tons of Powder River Basin coal in 1985 to more than 211 million tons in 1995 (Table II). By far the largest geographical segment is Japan, perhaps accounting for 60% of the total market in 1995. The electric utility industry is the largest of the industrial segments, representing as much as 80% of the total market by 1995.

The physical and chemical characteristics of PRB coal make this fuel unattractive for industrial consumption. For this reason, long-term sale to electric utilities is the only viable outlet for PRB coal in the Pacific Rim. PRB coal, however, will only capture a small portion of the electric utility market since competition in international coal trade is fierce. Domestic competitors include Utah, Colorado, Southern Wyoming, New Mexico, and Alaskan coals. PRB coal also faces formidable competition from Australia, South Africa, Canada and, to a lesser extent, Russia and China. At this time, BN is forecasting export of about 5-10 million tons of PRB coal in 1990. This is equivalet to about 3-6 trains per day. In 1995, PRB export might reach the 12-19 million ton level or about 7-11 trains per day.

As with most long-range forecasts, this one is incomplete without a caveat: There are many issues that must be resolved prior to signing of long-term contracts, such as plant start-up dates, fuel quality, and discharge port capabilities. Even if these issues are resovled, utility plans are bound to change over the next decade with the vissitudes of politics, economics, and technology.

Line Capacity of BN Routes to the Pacific Northwest

Burlington Northern currently possesses ample line capacity to move freight over the Cascade Mountains to Pacific Northwest ports. PRB coal for export would be routed over BN's southernmost mainline (old NP line) in Montana. Between Livingston and Missoula, Montana, trains pass through the Rocky Mountains, crossing two mountain passes. The first pass begins at Livingston and ascends the mountain for a distance of about 12 miles (19 km) to an elevation of 5,590 feet (1,677 meters). Maximum grade in this area is 1.8 percent. The second mountain pass crosses the continental divide a few miles west of Helena. Starting at an elevation of 3,900 feet (1,170 meters), the line ascends to an elevation of 5,561 feet (1,668 meters) at Blossburg over a distance of approximately 16 miles (26 km). The maximum grade on this ascent is 2.2 percent. Other than these two mountain passes, much of the line follows river grades or flatlands. There is an overall elevation drop of over 1,300 feet (390 meters) between Livingston and Missoula.

Beyond Spokane, four alternate mainline routes are available through the Cascades:

- Vancouver route along the Columbia River.
- Stampede route.
- Snoqualmie route via the old Milwaukee right of way.
- Stevens Pass route through the Cascade tunnel.

The Vancouver route proceeds southwest from Spokane to Pasco, then follows the Columbia River to the Port of Vancouver, Washington, and terminates at the Port of Astoria located at the mouth of the Columbia. The entire segment from Pasco to Vancouver is a descending grade and has proven quite successful in handling unit trains of heavy commodities such as grain. The line from Vancouver to Astoria is subject only to local service at this time. It has basically a zero grade which would be ideal for unit coal trains after improvements are completed. Specifically, much of the rail on this line must be relayed, ties replaced, sidings extended, and bridges strengthened. The cost of these improvements is manageable, however, if sufficient annual volume is secured.

The second route --the Stampede Route-- follows the same mainline from Spokane to Pasco, then heads northwest through Yakima and Ellensburg to Auburn. This line includes some steep grades -- up to 2.2%-- and a number of tight turns.

The third route is the former Milwaukee Snoqualmie Pass route, which roughly parallels the Stampede Pass route over the Cascades to Auburn. This route has the most favorable crossing elevations of any of the three BN routes over the Cascades, but the track is in poor condition and will require extensive upgrading before it can handle unit trains.

THE STEVENS ROUTE IS BN'S NORTHERNMOST ROUTE OVER THE CASCADES AND PASSES THROUGH THE EIGHT-MILE LONG CASCADE TUNNEL. THE ASCENDING GRADE IS MOSTLY 1.6%, REACHING 2.2% NEAR THE SUMMIT (2,883 FEET, 865 METERS). OVERALL, THIS LINE IS IN GOOD PHYSICAL CONDITION AND IS USED FOR MUCH OF THE HIGH PRIORITY CONTAINER AND AUTO TRAFFIC BN MOVES TO THE MIDWEST.

OUR COMPANY, UNDER RICHARD BRESSLER, PRESIDENT AND CEO, HAS MADE A MAJOR COMMITMENT TO DEVELOP INTERNATIONAL TRADE THROUGH NORTHWEST PORTS. THE DEVELOPMENT OF COAL EXPORTS IS A MATTER OF TOP PRIORITY FOR US. WE HAVE COMMITTED OVER $1.2 MILLION DOLLARS TO SIX DIFFERENT STUDIES WITH VARIOUS PORTS, COAL PRODUCERS AND COAL CONSUMERS. WE HOPE THIS SEED MONEY WILL HELP TO SOLVE SOME OF THE ENGINEERING AND ENVIRONMENTAL PROBLEMS WHICH MIGHT OTHERWISE DELAY PORT DEVELOPMENT. WHILE WE ARE STRONGLY IN FAVOR OF FURTHER PORT DEVELOPMENT, IN THE NORTHWEST AND ELSEWHERE, I WANT TO STRESS ONE POINT TO YOU -- BURLINGTON NORTHERN WILL NOT PLAY FAVORITES AMONG PORTS. WE BELIEVE ECONOMICS, AND ECONOMICS ALONE, SHOULD DICTATE WHERE THAT GROWTH OCCURS.

IN SUMMARY, BN HAS ANALYZED THE DEMAND FOR COAL AND OTHER EXPORT TRAFFIC THROUGH 1995 AND HAS DEVELOPED DETAILED ESTIMATES OF THE TRACK INVESTMENTS NECESSARY TO UPGRADE OUR FOUR ROUTES TO PACIFIC NORTHWEST PORTS. WE HAVE ALSO DETERMINED THE TYPES AND QUANTITIES OF EQUIPMENT NECESSARY TO MEET THIS DEMAND. THE COSTS OF THESE IMPROVEMENTS ARE MANAGEABLE AND THE WORK CAN BE COMPLETED BEFORE THE MOVEMENTS COMMENCE. BN'S EXPERIENCE DURING THE PAST DECADE IN GEARING-UP TO SERVE THE DOMESTIC STEAM COAL MARKET ADDS CREDENCE TO PLANNING ESTIMATES FOR MEETING THE EXPORT CHALLENGE.

Table I - Salient BN Coal Transportation Statistics

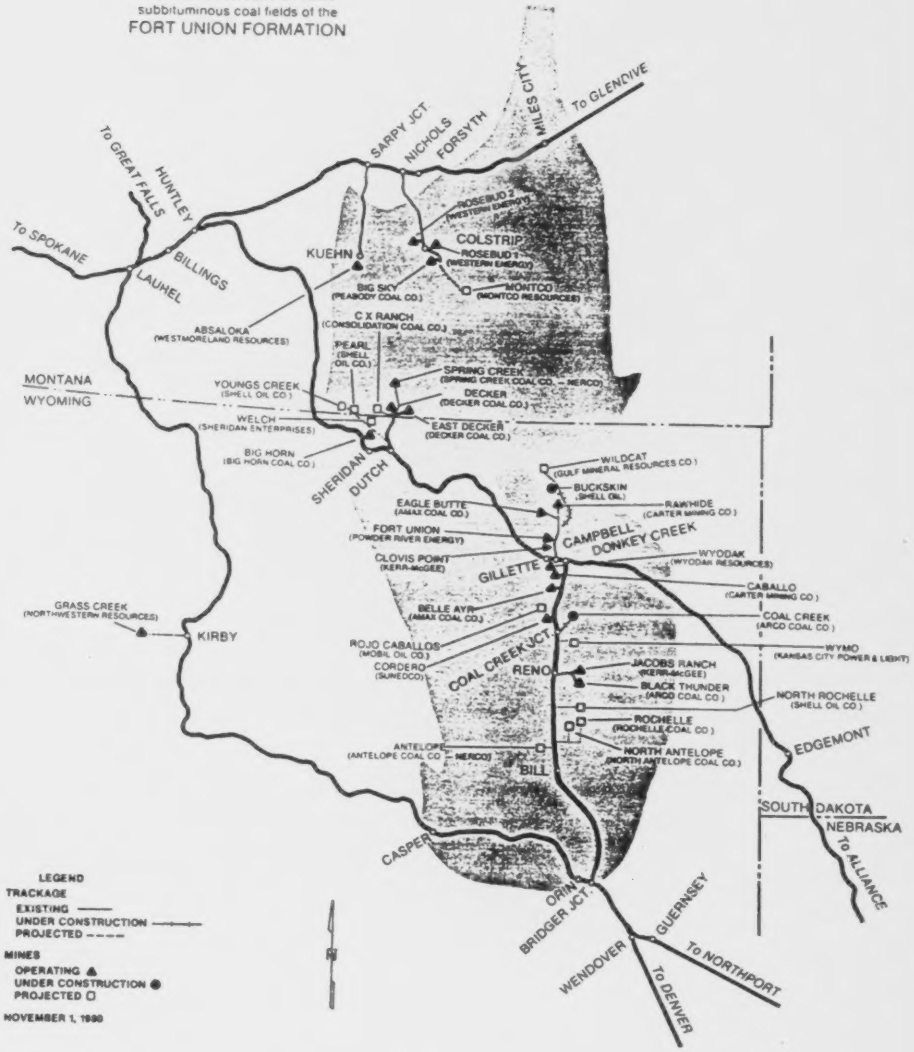
	1976	1977	1978	1979	1980
Revenue (millions)	$273.6	$372.9	$499.2	$721.1	$944.8
Tons originated (millions)	42.9	50.6	63.1	80.2	100.3
Revenue ton-miles (billions)	32.1	42.6	52.7	66.2	82.5

Table II: Far East Demand for Imported Coal

(Millions of Short Tons, PRB Coal Equivalent)

Country		Industry	1981	1985	1990	1995
Japan		Electric Utility	---	13.4	62.7	104.4
		Cement	---	14.0	15.0	16.6
		Pulp & Paper	---	1.6	2.7	4.5
	Subtotal		16.8	29.0	80.4	125.5
Taiwan		Electric Utility	---	8.1	19.9	32.9
		Cement & Others	---	5.3	8.5	12.7
	Subtotal		4.5	13.4	28.4	45.6
S. Korea		Electric Utility	---	5.9	10.1	11.5
		Cement		4.6	4.6	6.0
	Subtotal		1.7	10.5	14.7	17.5
Others (Hong Kong, Singapore, Malaysia)		Electric Utility	---	5.5	12.3	17.9
		Cement & Others	---	2.4	4.5	5.0
	Subtotal			7.9	16.8	22.9
	Grand Total		23.0	60.8	140.3	211.5

BURLINGTON NORTHERN
serves the
POWDER RIVER BASIN
subbituminous coal fields of the
FORT UNION FORMATION



Senator WARNER. We appreciate your coming and your testimony has been very informative.

A question or two. Do you have a position on the current ICC proceeding to deregulate coal export rates and would you explain your position and how deregulation would improve your service?

Mr. MICHON. I believe that our position is that we are in favor of this move, but only from an industry standpoint. I think as far as BN's situation with the Pacific rim goes, this will not affect our ability to conclude the kinds of contracts that I mentioned earlier.

I think that this issue is really more related to the eastern railroads than it is to our situation.

Senator WARNER. Let us go back to unit trains. Some testimony has indicated that unit train rates are not being used for export. As BN enters the coal export market or becomes more involved in it, I infer that you will perhaps consider unit train rates. Is this a correct assumption?

Mr. MICHON. Yes, sir, it is. In fact, I think we would have to insist upon it, because I think it is the only way we can compete both worldwide and vis-a-vis our other railroad competitors and the shippers with whom we discussed this are perfectly willing to negotiate that way.

Senator WARNER. I thank you, sir. I thank all of you who are present today. It has been one of our better hearings. We are now adjourned.

[Whereupon, at 12:25, the hearing was adjourned, subject to the call of the Chair.]

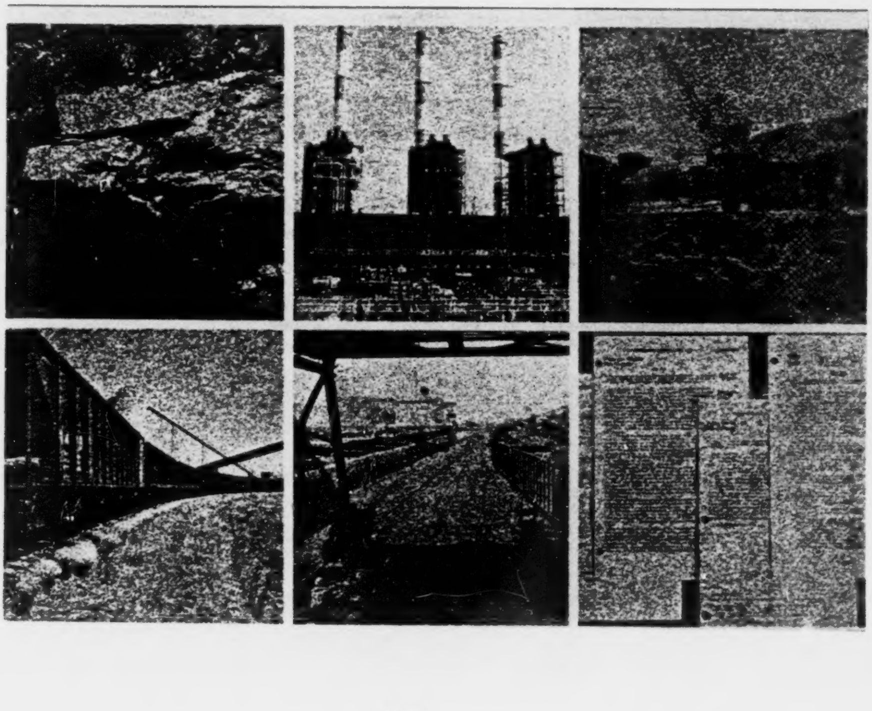
APPENDIXES

Appendix I

Selected Excerpts From the WESTPO Joint Study "Western U.S. Steam Coal Exports to the Pacific Basin"

Final Report

1. Western Coal Exports



Revised 12/18/81

WESTERN U.S. STEAM COAL EXPORTS
TO THE
PACIFIC BASIN

Summary Report

of the

Joint Study

of the

Western Coal Export Task Force

and the

Working Groups of

Japan

The Republic of China

The Republic of Korea

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WESTERN U.S. STEAM COAL EXPORTS
TO THE
PACIFIC BASIN

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December 1981

On behalf of

The Western Coal Export Task Force (CETF)

Under the auspices of the

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WESTERN COAL EXPORT TASK FORCE-PACIFIC BASIN STEAM COAL EXPORT STUDY

Governor Scott M. Matheson (Utah)
Chairman

Philip M. Burgess
Study Director

Western Coal Export Task Force

Coal Producers

AMAX Coal Company
Amoco Minerals Company
ARCO Coal Company
Coastal States Energy Company
Colorado Westmoreland
Diamond Shamrock Corporation
Getty Oil Company
Mobil Oil Corporation
NERCO, Inc.
Northern Coal Company
Peabody Coal Company
Peter Kiewit & Sons', Inc.
Rocky Mountain Energy Company
Santa Fe Mining Company
Shell Oil Company
Sprague Coal International
Utah International, Inc.
Valley Camp Coal Company
Westmoreland Resources, Inc.
W. R. Grace & Company

Railroads

Atchison, Topeka and Santa Fe Railway Company
Burlington Northern, Inc.
Denver & Rio Grande Western Railroad Company
Southern Pacific Transportation Company
Union Pacific Railroad Company
Western Pacific Railroad Company

Ports and Port Developers

Kaiser Cement Corporation
Lone Star Industries, Inc.
Pacific Resources, Inc.
Port of Bellingham
Port of Grays Harbor
Port of Kalama
Port of Long Beach
Port of Los Angeles
Port of Portland
Port of Redwood City
Port of Sacramento
Port of Stockton
Port of Vancouver
Tulalip Tribes
Wickland Oil Company
Weyerhaeuser Company

Japan Working Group

Japan Coal Development Company, Lead Organization

Republic of China Working Group

Taiwan Power Company, Lead Organization

Republic of South Korea Working Group

Korea Electric Company, Lead Organization

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FOREWORD

The release of the reports of the Western Coal Export Task Force (CETF)-Pacific Basin Steam Coal Export Study marks the culmination of a joint effort between buyers and sellers and between U.S. industry and state government. The goal of this effort has been to expand opportunities for long-term, large-volume steam coal trade between the western U.S. and Pacific Basin countries, principally Japan, the Republic of China (Taiwan), and the Republic of South Korea.

With this goal as a guide, the Western Coal Export Task Force, organized under the auspices of the Western Governors' Policy Office (WESTPO), cosponsored this joint study with coal-using industries in the three principal Pacific Basin countries.

The primary objective of the study has been to provide a comprehensive assessment of demand in key Pacific Basin markets and of the production and transportation capacity of western coal-related industries to export coal from the western United States to those markets. That objective, I believe, has been accomplished, and with a high degree of quality. We have produced the single most comprehensive compilation of information on western coal production, related transportation systems, and Pacific Basin markets.

The less tangible results of the study are no less significant:

1. Coal producers, railroad executives, and port developers; state government; buyers; environmental leaders; and specialists in natural resources, transportation, law, marketing, and other fields together contributed their thinking to a common product.

2. As a result of the Task Force, more U.S. companies are involved in coal exports and optimistic about its prospects. I view this as an outcome that will help promote the health and vitality of the western coal industry.

3. The confidence of Pacific Basin business and government leaders in the western U.S. as a stable, responsible trade partner has been strengthened.

4. Both U.S. exporters and Pacific Basin coal users see better the value of trade between our two regions — not only in coal but in other commodities as well.

The relationships and processes developed during the joint study can serve as the basis and model for continuing cooperation between western governors and industry leaders, and between the western U.S. and the Pacific Basin region in matters related to trade and international market development.

On behalf of my fellow governors who served on the Western Coal Export Task Force Steering Committee and of the western business leaders who served on our Policy Liaison Group, I am pleased to present this report. I am also pleased to have participated in this unique effort to strengthen public-private, interstate, and international relationships while advancing the interests of all involved to expand the use of coal as an energy source and thereby reduce our dangerous reliance on imported petroleum from unstable areas.

Scott M. Matheson
Governor of Utah
Chairman, Western Coal Export Task Force

PREFACE

A. BACKGROUND AND PURPOSE

In October 1980, in the offices of Utah Governor Scott M. Matheson, western U.S. industry leaders formed the Western Coal Export Task Force (CETF) under the auspices of the Western Governors' Policy Office (WESTPO). The Western CETF brings together coal producers, railroad executives, and West Coast port developers with governors of the western states in a common purpose: to foster long-term, large-volume steam coal exports to Pacific Basin markets. The Western CETF resulted from a year of intensifying interest by both steam coal exporters in the western U.S. and buyers in the Japan, South Korea, and Republic of China utility, cement, and steel industries in working out together, in a disciplined forum, ways and means of increasing coal trade opportunities.

In early 1981, the Western CETF proposed a study to be jointly sponsored with coal-using industries in the Pacific Basin. The purpose of the joint study was to try to resolve what came to be described as the "chicken and the egg problem" — that is, Pacific Basin steam coal users are hesitant to consider long-term, large-volume contracts without the assurance that adequate production, inland transportation, and port-handling capacity will be developed, while U.S. mine, railroad, and port operators and developers are reluctant to invest in such facilities until long-term contracts have been signed. The approach of the joint study was to collect, verify, consolidate, and synthesize information related to these issues — information that business could then use, if it chooses, in making business decisions that will trigger a long-term, stable coal trade. A less tangible but no less significant purpose is to provide a forum for consensus-building on both sides about the issues and actions that can impede or facilitate coal trade.

Formal agreements were consummated with the Japan Coal Development Company (JCD), Taiwan Power Company, and Korea Electric Company (KECO) in early 1981, and the Western CETF-Pacific Basin Steam Coal Export Study was initiated in June 1981.

The Western CETF was charged by its U.S. sponsors and its Pacific Basin counterparts with submitting its preliminary findings on supply and demand in U.S.-Pacific Basin coal trade in September 1981 and its final report by December 31, 1981.

B. STUDY APPROACH AND METHODOLOGY

In approaching the task of developing a framework of information on coal exports, the Western CETF divided into five main industry task groups, studying market demand, coal supply, overland transportation, ports and marine transportation, and institutional/regulatory factors.

Each task group was headed by a leader from one of the principal coal export industries: coal producers, railroads, and ports. Executives from these industries were joined by state government officials to constitute the working members of the task groups. Each task group was assisted by a technical associate.

The study methodology included:

1. **Literature reviews.** Each task group refined the key questions and identified, assembled, and integrated previously published information addressing those questions.
2. **Surveys.** Formal survey instruments were developed for U.S. ports, receiving ports, and coal-using facilities, including utility, cement, and steel plants in Japan, South Korea, and the Republic of China. The survey of western U.S. ports inventoried

physical features, such as water depth, available acreage, and rail access; environmental considerations; and expansion or construction plans. The survey of coal-using facilities solicited data on characteristics such as generating or productive capacity, coal quality specifications, construction or conversion plans, commission dates, and environmental considerations. The survey of receiving ports was designed to assess the compatibility of physical specifications and timing of construction plans of those facilities with the planned facilities on the West Coast of the U.S.

3. **Interviews.** Unstructured interviews of top and middle management and technical personnel in industry and government were conducted. Information gleaned from these interviews was aggregated as appropriate and the discussion of issues reflects a variety of opinions and views. Interviews were also used to validate or otherwise evaluate data from other sources.

4. **Aggregate data analysis.** Data compiled by the western states and the U.S. Department of Energy (DOE) for the Western Coal Survey, and by Keystone for the Keystone Coal Expansion Survey were subjected to secondary analysis in order to develop estimates of the western U.S. coal supply. Western states' data included New Mexico's Energy Resources (1980), Utah Energy Department: 1981-1990, and the Wyoming Minerals Development Monitoring System. The resulting profiles were subsequently assessed and validated via interviews of industry and state government officials.

5. **Computer compilation and graphics.** Data on coal supply were entered into a data base in order to compile, aggregate, and graphically present information on coal supply. Bar graphs, city scapes, and mine-by-mine readouts were generated for the major coal basins of the West.

6. **Site visits and overflights.** Task group members and technical associates visited coal producing, transporting and consuming facilities on both sides of the Pacific. Delegations to Japan, South Korea, and the Republic of China (RoC) visited utility, cement, and steel plants, as well as existing receiving coal terminals and sites of planned facilities. On the U.S. side, task group members visited coal mines and ports, participated in overflights of coal production areas and port basins, and traveled on rail routes that transport coal.

7. **Review and approval.** Drafts of all reports were subjected to extensive review by industry participants (including both policy and technical personnel), state agency staffs, national environmental leaders, and representatives of Indian tribal councils. The reports reflect their comments and suggestions. All reports were formally reviewed and approved by the Policy Liaison Group, which is the board of directors of the Western Coal Export Task Force.

The result of these activities is a set of reports that covers physical, political, economic, environmental, technological, and institutional factors affecting coal trade.

C. THE STUDY REPORTS

The findings of the study are contained in a set of seven reports, Western U.S. Coal Exports to the Pacific Basin covering the full scope of the study.

1. **Executive Summary**, concisely lays out the most salient elements of western steam coal production, overland transportation, port handling, and sealift, as well as Pacific Basin markets — the "coal export chain." It also summarizes implications and options for facilitating a healthy coal trade. Chief executives, legislators, members of the media, and others will find it a succinct and useful summary of the study's major findings and conclusions.

2. Volume 1, **Summary Report**, summarizes and synthesizes an extensive range of information on coal markets, production, and transportation, gleaned from the technical reports produced out of the joint study process. It draws implications to coal trade of the most critical factors and details concrete options for triggering substantial coal trade between the western U.S. and Pacific Basin countries.

3. Volumes 2 through 6 are **Technical Reports** which present detailed information compiled, validated, and synthesized by each of the Industry Task Groups.

   a. Volume 2, **Report of the Demand Task Group**, details Pacific Basin markets for western steam coal — principally in Japan, the Republic of China, and the Republic of South Korea. It includes quantity, type, and quality specifications; timing of need; committed and uncommitted volumes; technological changes influencing decisions; and share for western U.S. suppliers. The Demand Task Group drew its information from official reports in each country as well as from informal analyses by banks, trading companies, research institutes, and others. The Task Group also synthesized the results of discussions with Pacific Basin industry executives — including the utility, cement, and steel industries — and government agency officials.

   b. Volume 3, **Report of the Supply Task Group**, inventories western U.S. mines and discusses factors influencing coal production. It includes production capacity; quality specifications; location; timing of availability; and quantities committed to contract. It covers all the major coal fields in the West. The report aggregates this information by coal basin while also supplying mine-specific data in appendices and maps. Regulatory, permitting and institutional factors affecting western resource availability and productivity are also laid out.

   c. Volume 4, **Report of the Overland Transportation Task Group** profiles each of the western railroads that are patented carriers of export coal — including an analysis of line capacity; grades; alignment; and related factors. The role of trucks, barges, and slurry pipelines is also considered. Information is also included on mine mouth links (truck, rail, or other), rail system capacity by line segment, and rail-port links, including the number of at-grade crossings on approaches to port sites. It also covers physical and environmental constraints, potential for expansion and upgrading, lead times for expansion, tariffs, rail car and coal slurry technologies, and trucking and barging options. The report includes maps that lay out in detail the routes of each railroad.

   d. Volume 5, **Report of the Port and Marine Task Group**, sets forth considerations and options in developing coal ports on the West Coast of the U.S. It includes information on the size, configuration, and ownership of the present and planned world bulk vessel fleet, as well as factors affecting the cost and efficiency of sealift transportation alternatives — including Panamax and VLCCs. The report also covers capacity and timing of development for receiving ports, synthesized from research and discussions with industry and government officials in Japan, South Korea, and the Republic of China. The physical and environmental aspects of announced plans to expand West Coast port capacity, capital and operating costs, and lead times for port expansion are also covered. The report includes marine charts and aerial photographs of the 26 planned West Coast port sites.

   e. Volume 6, **Report of the Institutional/Regulatory Task Group**, highlights the most relevant features of the regulatory and institutional climate affecting coal exports in the western U.S. It includes factors influencing joint venture arrangements and foreign investments; coal leasing laws; regulations affecting coal production and transportation, such as surface mining, air quality, and coastal zone management regulations; manpower, health, and safety factors; and legislative initiatives. The report draws on the expertise of specialists in industry, government, the law, and the social and management sciences.

D. FUNDING

Funds for the joint study were provided by industry sponsors in the four participating countries. In the U.S., the contribution of the Western Coal Export Task Force (CETF) came entirely from its industry members — coal producers, railroads, ports, and port developers. In the Pacific Basin, the Japan Coal Development Company (JCD), Taiwan Power Company, and Korea Electric Company (KECO), contributed matching amounts under parallel but separate agreements with the Western CETF.

E. CONCLUSION

This study is not designed to make business decisions. It does not recommend specific mines, railroad routes, or port sites. Yet, investment decisions are needed today and over the next 36 months for steam coal trade five years from now. Therefore, the study has compiled, verified, and synthesized information for business and government to use, if they choose, in making decisions that will effect that coal trade.

The joint study process has established in both the U.S. and Pacific Basin an appreciation of the opportunities and challenges that are inherent in a mutually beneficial steam coal trade. The joint study process has served as a point of contact for foreign representatives to obtain information and register concerns. The joint study has served as a public forum for expressing views on both sides about problems that must be solved to implement large-volume, stable steam coal trade. The joint study has also served as a clearinghouse for innovative ideas from both industry and government.

We hope the study results and relationships developed during the study process can contribute even more tangible results in the months to come.

Philip M. Burgess
Study Director

Summary of the Report

A. INTRODUCTION AND OVERVIEW

Energy and politics. Political upheavals in the Middle East in 1978-79 underscored the vulnerability of all industralized nations to imported oil. As a consequence, many nations — and particularly Pacific Rim industrial nations (e.g., Japan, South Korea, and the Republic of China) — began to look to alternative fuel sources, including coal, LNG, and nuclear.

The turn to coal — especially to steam coal for use by utilities and by industries needing thermal power (cement, paper and pulp, chemical, and others) — created a new potential market for U.S. coal producers.

Potential new coal markets. For western U.S. coal producers, the market potential for coal export to Japan, the Republic of Korea, and the Republic of China (RoC) was particularly attractive. However, in early 1979, preliminary discussions between potential buyers in the Pacific and western U.S. sellers indicated dim prospects for U.S. export coal to capture a major share of emerging coal markets in Japan, Korea, and the RoC. Much of the demand was being filled by Australia and other coal suppliers, and there was substantial concern about the capacity of U.S. infrastructure to carry large volume coal exports.

The need for a focused approach. Owing to dim prospects for achieving a major share of the Pacific Rim market, leaders of state government and coal chain industries on the U.S. side (coal producers, railroads, and port developers) formed the Western Coal Export Task Force (CETF). The purpose of the Western CETF was to facilitate cooperation between industry and government on the U.S. side and between buyers and sellers around the Pacific Rim. The objective was to help identify and remove barriers to coal exports from the western U.S. to Pacific Rim nations on a long-term, large-volume basis.

The chicken-and-egg problem. In early 1981, following more than a year of informal discussions among western U.S., Japanese, South Korean, and RoC principals, the Western CETF proposed a study to be jointly sponsored and implemented with coal-using industries on the western edge of the Pacific Rim. The purpose of the joint study was to help resolve what has to come to be described as the "chicken-and-egg problem" — that is, the hesitance of Pacific Rim steam coal users to consider long-term, large-volume contracts without the assurance that adequate production, inland transportation, and port-handling capacity will be developed on the U.S. side and the reluctance of U.S. mine, railroad, and port operators and developers to invest in such facilities until large-volume, long-term contracts have been signed.

The approach of the Joint Study was to collect, verify, consolidate, and synthesize information related to these issues — information that business could use, if it chooses, in making business decisions that will trigger a long-term, stable coal trade. A less tangible but no less significant purpose was to provide a forum for consensus-building on both sides about the issues and actions that can impede or facilitate coal trade.

This report — one result of that process of multinational as well as public-private collaboration — is supplemented by five technical reports on the coal chain that links western U.S. mines with coal users in Japan, South Korea, and the RoC.

The findings. The findings of the Joint Study indicate that the chicken-and-egg metaphor may not be an abt description of the barriers to expanded western U.S.-Pacific Rim coal trade. Though the metaphor is used as a way of posing the ageless first-cause dilemma — where observers are paralyzed by the question of which was first created, the chicken or the egg — the fact-finding and analysis undertaken by the Joint Study reveal that the coal trade between the western United States and Japan, the Republic of China, and South Korea is **not** such an irresolvable dilemma.

Producers, transporters, and users of western U.S. steam coal need not and should not wait upon one another to make the first commitment. Indeed, no one set of interests would be well-served by unilateral decision-making on the part of other interests. Cost-effective expansion of this coal trade depends on good faith, cooperation, and well-timed coordination. Capacity must grow apace in all sectors of the coal chain — production, inland transportation, port loading, marine transport, unloading, and end-use. Negotiations about price and volume should take the long view, because sound development of expanded coal trade necessarily is a long-term undertaking. Figure 5 and Figure 10 show why.

The Joint Study makes a strong case for the feasibility of expanding the coal trade between western U.S. producers and the Pacific Rim countries. It does so because the systematic study of potential demand, supply, transportation capacity, and cost, coupled with other non-price economic considerations (such as supply security and diversification) show that this trade logically should expand.

Trade expansion offers specific benefits to all participating parties as well as the several national economies involved. The Joint Study reveals that the initial skepticism about the feasibility of expansion, which found expression as the "chicken-and-egg problem", is not justified by the facts at hand. But the study also suggests that expansion probably cannot be achieved until the skepticism is fully dispelled. Accordingly the report offers a reasonable, objective basis for optimism, for forward-looking negotiation and cooperation, and for mutually-supportive business decisions.

In brief, the main findings and conclusions of the Joint Study are summarized below:

Demand. The Pacific Rim countries, all heavily dependent on imported oil, are likely to make serious efforts to diversify their energy fuels and their sources of supply during the 1980s. In addition, Pacific Rim users, and particularly power companies, are expected to seek to procure steam coal on a large-volume, long-term contract basis, so as to secure a reliable fuel supply.

Would-be exporters into the Pacific Rim should be encouraged by the fact that some two-thirds of the coal projected to be consumed in the Pacific Rim by 1990 has not yet been committed to a supply arrangement. Producers in the western United States realistically can expect to export between 8 and 11 million tons of steam coal to Pacific Basin nations by 1985, and 19 to 26 million tons by 1990 — and perhaps more, depending on the skill of U.S. marketing and on other developments in the market environment.

Supply. Mines in the western United States have increased their total production of low-sulfur bituminous coal by nearly 155 million tons annually over the past decade — a 600 percent increase. Demonstrated reserves total more than 99 billion tons (not counting Alaska's 140 billion tons of identified reserves), and production is expected to more than double in the 1980s. Production capacity probably will increase somewhat more than that. The American domestic market for coal is soft and may continue in that situation for some time. Therefore, export possibilities are attractive.

Production capacity is distributed among more than 100 competitive mines with high productivity records. Sufficient coal-bearing land to yield an additional 240 million tons a year is already under lease and ready to be put in production. Government procedures for leasing additional lands are now in place and new lands were leased in 1981 — the first in ten years.

The work force in mines in the western states is relatively young, well-educated, satisfied with working conditions, and optimistic about the future of western mining. Highly productive surface mining will account for 86 percent of projected capacity by 1985, and large-scale operations are the rule. A federal study of the U.S. coal-mining industry in 1979 concluded that the long-term outlook in the western states is for a "stable industrial and social climate."

Inland Transport. Eight railroads in the western United States link the region's coal basins to the West Coast. Haulage distances range between 900 and 1,500 miles — a major factor in the FOB* price of western steam coal. However, long-term contracts, which American railroads are now free to negotiate because of changes in federal law, make new economies possible. Highly efficient unit-train operations could be established and other technical and management improvements could be made. The rail line capacity of the western railroads to handle greatly increased tonnage is demonstrated — both by experience and by theoretical analysis. Moreover, most coal export terminals planned along the West Coast will be accessible by more than one established railroad carrier.

Ports and Marine Transport. Port capacity on the U.S. West Coast needed to handle steam-coal exports in the volumes projected for 1990 has not been developed. But California ports were able to handle a nine-fold increase in coal export throughput between 1980 and 1981, and extensive plans are being drawn for large-scale expansion of export terminal capacity.

Plans have been announced for the development of steam coal export facilities at 26 different locations on the U.S. West Coast. Investors will be most responsive to port development opportunities that include long-term, large-volume arrangments between buyer and seller.

Two coal-slurry pipelines have been proposed between mines in the western states and the West Coast, but this technology is not expected to have much impact on the coal trade in the 1980s. Planned expansion of export facilities will accommodate the trend toward the use of large, cost-efficient, bulk vessels of 100,000 DWT or more.

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*Free-on-Board (FOB) price.

While very large drybulk-cargo ships will carry an increasing share of coal tonnage into the Pacific Rim countries, at least 40 percent of this tonnage will still be transported in Panamax size vessels (60,000 DWT or smaller) by 1990. Port development along the U.S. West Coast is planned to accommodate ships of all sizes and drafts. Therefore, a variety of arrangements to meet a wide range of needs along the Pacific Rim can be negotiated.

B. THE CHICKEN AND THE EGG AS A U.S. CAPACITY ISSUE

Supply. The technical report on coal supply identifies 108 operating mines in ten coal producing regions in eight western states. The report also shows rapidly expanding coal production in the western U.S. — from 6 percent of U.S. production in 1970 (29 mty) to 26 percent in 1980 (over 180 mty), to more than 50 percent of U.S. production in 1990 (400-600 mty projected).* Actual production for the past ten years is shown in Figure 1.

The technical supply report provides massive evidence for the conclusion that western U.S. coal producers, using existing capacity, can supply any projected level of demand for steam coal — both in terms of quantity and quality requirements — that might develop among Pacific Basin steam coal users. Coal availability data are displayed in Appendices A and B and coal quality data in Appendix C. In summary, these data show:

1. The capacity of western coal mines is projected to increase from the 189 million tons per year in 1980 to 377 million tons in 1985 and to 513 million tons in 1990. Appendix A shows capacity and contract levels for each coal region in the study. Appendix B presents the same information in tabular form.
2. Sixty-four percent of planned 1985 capacity and 57 percent of planned 1990 capacity is reported to be under contract as of 1980.

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*Coal is measured in metric tons.

FIGURE 1

COAL PRODUCTION FOR SELECTED WESTERN STATES
(Million Tons)

	1970[a]	1974[a]	1978[b]	1980[b]
Alaska	.55	.70	.71	.80
Arizona	.13	6.45	7.85	10.98
Colorado	6.03	6.90	14.41	18.67
Montana	3.45	14.11	26.66	29.86
New Mexico	7.36	9.39	12.78	18.86
Utah	4.70	5.86	8.87	12.73
Washington[c]	.09	3.91	4.71	5.15
Wyoming	7.20	20.70	57.27	91.99
TOTAL	29.51	68.02	133.26	189.04

Source: CETF. **Report of the Supply Task Group.** (Mountain West, 1981).

[a] Minerals Yearbook: Metals, Minerals & Fuel Vol. I, U.S. Dept. of Interior, 1970 and 1974.

[b] Mine Safety & Health Administration, Quarterly Mine Production Report 1978 & 1980.

[c] 1970-76 State Mine Inspectors Annual Report.

3. Therefore, 137 million tons is estimated to be available in 1985 and 221 million in 1990. Appendices A and B both show the distribution of this supply potential among the various regions included in this study.

4. The quality of coal produced across the region varies. In general, however, it has sufficiently high heat, low sulfur content, and other characteristics to meet the needs of the Pacific Rim buyers. Appendix C compares the BTU and sulfur content of coal produced in each region during 1980.

5. The West has massive reserves that allow for even greater production should the market materialize. Total "demonstrated" reserves in the West exceed 99 billion tons. In addition, there are more than 140 billion tons of "identified" reserves in Alaska.

Transportation. When the delivered cost of coal to the Pacific is analyzed by cost component, it is clear that a steam coal trade with the Pacific Basin is at least as much a transportation as a coal business. Indeed, the mine mouth coal cost accounts for one-third or less of the delivered cost of coal. The configuration of inland rail transportation, of marine transportation, and the intermodal transfer facility (or coal port) which connects rail to ship, plays a critical role in determining the final delivered cost of coal to Pacific Rim users.

The technical report on inland transportation — including railroad, pipeline, barge, and trucking modes — focuses on the capacity of the railroads to haul coal to west Coast ports. Eight existing or potential railroad coal carriers are examined: the Alaska Railroad, the Santa Fe, the Burlington Northern, the Denver and Rio Grande Western, the Southern Pacific, the Union Pacific, the Utah Rail Way, and the Western Pacific.

A detailed "capacity analysis" of 59 rail segments that constitute the export routes of these eight railroads reveals unused capacity on 53 of 59 segments. These findings are shown in Figure 2.

In short, these and other findings from the inland transportation report clearly show that western U.S. railroads have the line capacity, the financial capacity, and the management capacity (including the use of

FIGURE 2

A SUMMARY CAPACITY ANALYSIS OF EIGHT WESTERN RAILROADS

RAILROAD	LINE SEGMENTS ANALYZED	SEGMENTS WITH LATENT CAPACITY	SEGMENTS APPROACHING CAPACITY	TOTAL LINE SEGMENTS
Alaska Railroad	1	1	0	1
Atchison,Topeka,and Santa Fe	9	8	1	9
Burlington Northern	14	10	4	14
Denver and Rio Grande Western Railroad	6	6	0	6
Southern Pacific Transportation Company	10	9	1	10
Union Pacific Railroad	11	11	0	11
Utah Railway	1	1	0	1
Western Pacific Railroad	7	7	0	7
TOTAL	59	53	6	59

Source: CETF. **Report of the Overland Transportation Task Group** (DeLeuw-Cather and Company, 1981), p. 99.

state-of-the-art rolling stock and unit trains) to carry coal in any volumes that might be required by Pacific Rim users to any port on the West Coast of the U.S.

In addition, there is substantial work underway to develop, test, and evaluate pipeline transportation systems — including conventional water slurries; non-water slurries, such as coal-oil mixtures (COM), synthetic fuels produced from coal (e.g. methanol and ethanol), and carbon dioxide (CO_2); and non-slurry or "capsule pipeline" systems. As a result, these and other alternative transport mediums may provide feasible, reliable, and cost-efficient options for moving coal to West Coast ports by 1990.

Ports. The technical report on port and marine transportation covers both onloading and offloading ports. The report identifies 26 U.S. West Coast port candidate sites with an interest in building coal export facilities. These candidate sites are shown in Figure 3.

The report shows existing or potential sites in Puget Sound (7), along the Columbia River (6), on the West Coast of Oregon and Washington (2), in the San Francisco Bay area (7), in the southern California area (3), and in Alaska (1). Some of these port sites — and especially those in Puget Sound and southern California — have sufficient water depth to accommodate very large bulk carriers of 150,000 DWT or more, and others could handle deep-draft bulkers with some amount of dredging. Channel depths and other port characteristics are shown in Appendix D.

Japan's coal port development plans calls for receiving coal at a total of 20 ports divided into three categories: coal centers, electric power ports, and publicly- or privately-operated ports. Korea plans the development of two major electric power ports and four regional public or private ports. Taiwan's program is to develop one coal center and two electric power ports, and to continue the operation of the four public coal unloading ports. Locations, characteristics, and capacities of receiving ports are laid out in Appendix E.

Despite shipping economies of large bulkers, none of the importing countries intends to rely exclusively on that portion of the world fleet

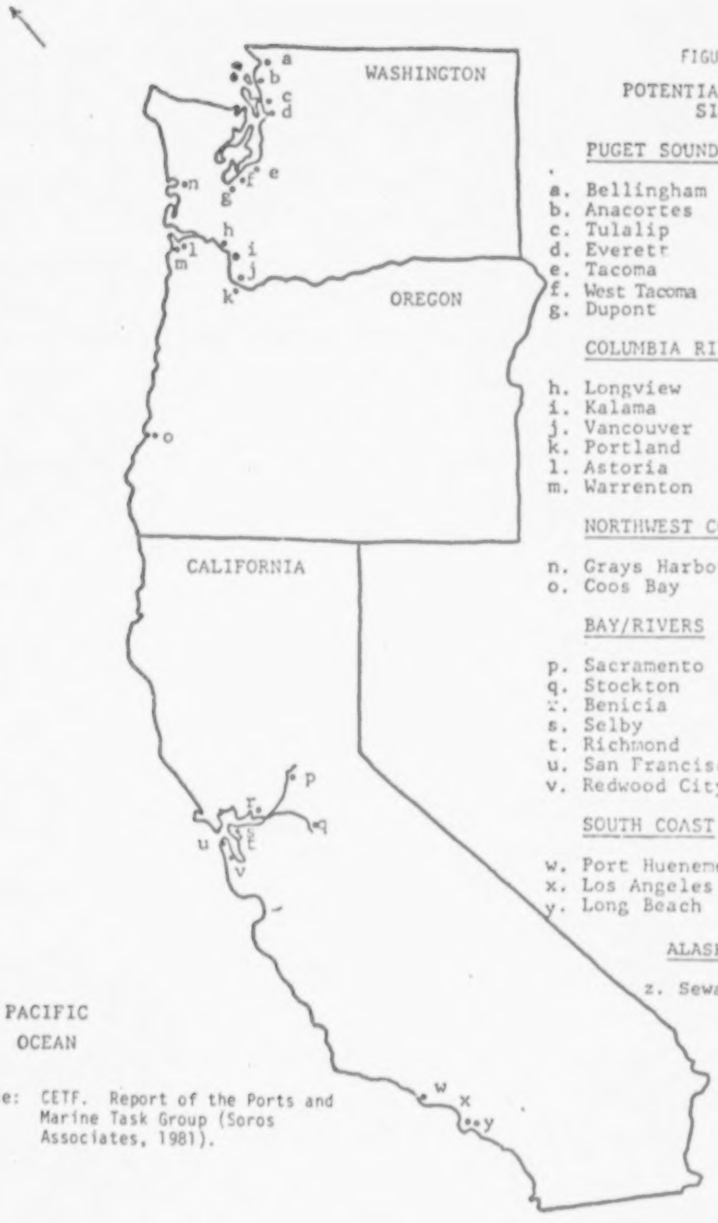

FIGURE 3

POTENTIAL TERMINAL SITES

PUGET SOUND

a. Bellingham
b. Anacortes
c. Tulalip
d. Everett
e. Tacoma
f. West Tacoma
g. Dupont

COLUMBIA RIVER

h. Longview
i. Kalama
j. Vancouver
k. Portland
l. Astoria
m. Warrenton

NORTHWEST COAST

n. Grays Harbor
o. Coos Bay

BAY/RIVERS

p. Sacramento
q. Stockton
r. Benicia
s. Selby
t. Richmond
u. San Francisco
v. Redwood City

SOUTH COAST

w. Port Hueneme
x. Los Angeles
y. Long Beach

ALASKA

z. Seward

Source: CETF. Report of the Ports and Marine Task Group (Soros Associates, 1981).

which is 100,000 DWT or larger. On the contrary, over 40 percent of the three nations' projected 1990 coal unloading capacity is expected to be for Panamax or smaller.

Thus all of the western U.S. port candidates have the potential to handle export coal efficiently. Though some ports are more likely than others to contribute to a lower delivered cost of coal to the Pacific Basin market, all together — both shallow and deep-draft — can contribute to an efficient coal export chain.

State-of-the-art technology exists for the construction of modern coal ports which can achieve very rapid train and ship turn-around times — including the ability to unload a 100-car unit train in two to four hours and to load large-size bulkers at a rate of 7500 metric tons per hour. In addition, a modern port provides storage to separate rail delivery from shiploading so that these functions are independent of one another. The principal contribution of such a modern state-of-the-art coal port is to increase opportunities to use unit trains and thus reduce rail freight rates. A modern port also provides the opportunity to increase the use of large bulkers and thus reduce marine costs by avoiding demurrage charges and taking advantage of economies of scale. Finally, large coal ports have potential for economies of scale in capital cost per ton and in operating costs.

It is important to note that existing West Coast coal port facilities are not modern coal transshipment facilities by these criteria. In their present configuration, they do not accommodate true unit train service nor fast ship loading of large bulk carriers. Consequently, today's coal export prices are not a true indication of what future prices might be when a modern coal port is operative, one that permits the development of an efficient coal chain through the use of unit trains and modern storage and handling facilities at the terminal. However, opportunities exist to custom design ports to fulfill users' requirements and to modernize efficiency.

This report makes no effort, by agreement of the sponsors in advance of the study, to identify which of the 26 port sites are best suited to be major coal export facilities. It is clear, however, that both shallow and deep-draft ports may be needed to serve a substantially expanded coal trade, that a substantially expanded coal trade is needed to justify the construction of one or more deep-draft superports with unit train service and modern handling facilities, and that among the 26 sites some are well-suited by virtue of channel characteristics, railroad service, construction/expansion costs, and environmental and other considerations to become a modern superport before the decade is over.

It should be remembered that in 1980, western U.S. ports shipped 600,000 tons of coal. In 1981, they shipped over five million tons of coal. Western port operators have clearly demonstrated their willingness and ability to expand capacity to meet expanding throughput requirements. On-line planning, financing, and construction will increase U.S. port capacity to at least ten million tons per year by 1985 by upgrading existing facilities.

In short, western U.S. ports already have the capacity to handle current market demand. In addition, the capacity to handle expected market demand for 1985 is in the advanced stages of the development process in the ports of Long Beach, Los Angeles, Stockton, and Selby in California; in Portland, Oregon; and in Kalama, Washington. Additional shallow-draft and deep-draft port operators and developers are prepared to develop coal export capacity when throughput commitments justify the investments.

Summary. As a consequence of the findings presented in the technical reports on coal supply, inland transportation, and ports, it is clear that there is no chicken and egg problem over the short term — i.e., over the next five to ten years. The U.S. has the capacity in place to produce and carry current demand and has the ability to put in place the inland transportation and port capacity to supply higher volumes that approach the 30-40 percent range of demand potential in Japan, Korea, and the RoC.

C. THE CHICKEN AND THE EGG AS A PRICE ISSUE

Price components. The chicken and the egg issue is increasingly expressed as a price issue. That is, Pacific Rim buyers say that their hesitancy to consider long-term, large-volume contracts reflects less a concern about our infrastructure capacity and more a concern about the high delivered price of U.S. coal.

It should be noted that less than $10 per ton separates the CIF* Japan price of Australian coal and coal delivered from the western U.S. It should also be noted that the two principal cost components in the total CIF cost of coal from the western U.S. to the Pacific Rim are inland transportation and sealift.

Inland transportation can amount to 25 to 40 percent of the delivered price of a ton of western U.S. coal. Sealift can amount to 15 to 25 percent. Total transportation and handling costs together can add up to nearly 70 percent of the delivered price. Indeed, coal export is primarily a transportation business, not a coal mining business.

Accordingly, transportation improvements provide the greatest leverage to achieve new cost efficiencies.

Railroads. There has been great interest in developing data on western rail haulage rates and costs. However, owing to a recent change in federal law and other considerations, historical data on prices are not likely to be useful in estimating future prices.

First, the regulatory environment has changed substantially. Perhaps most important in this regard is the recent passage of the **Staggers Rail Act of 1980**, providing the legal base for substantial regulatory changes in the railroad industry. Of particular interest to the haulage of coal is the new flexibility allowed in rate making and the provisions allowing contracted rail rates. The latter provision is important because it is now possible to negotiate long-term contracts for railroad transportation.

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* Cargo, Insurance, and Freight (CIF) price components.

Second, because the export of coal through West Coast ports is a new trade development, the opportunity now exists to implement inland transportation services that use modern planning and management techniques and state-of-the-art rolling stock.

In this regard, it is important to note that coal is now being exported through West Coast ports in train load volumes (i.e., bulk trains), not unit trains. The more cost-efficient **unit train** is used for the movement of a commodity between a single point of origin and a single point of destination. A typical unit train will carry 10,000 tons of coal in 100 or more 100-ton cars. A unit train can be thought of as a "shuttle" train. The train is a "unit" with motive power and cars staying coupled as it is loaded and unloaded, and it is operated on a specific schedule. The key to unit train efficiency is rapid turn-around time at both the onloading terminal (at the mine) and the offloading terminal (at the port). Using less than four hours to load (or unload) permits maximum utilization of a large capital investment.

Train-load volume movements, by contrast, do not use "dedicated" cars or locomotives. After unloading, all rolling stock is free to be relocated to any available loading point. In the case of West Coast ports, true unit train operations cannot be practiced until large-volume coal movements are contracted and until high capacity port transshipment facilities are constructed.

Thus, for these two reasons alone — the opportunity provided by the Staggers Act to negotiate long-term contracts and the opportunity to achieve significant efficiencies by the use of dedicated unit trains — reduction of future coal haul prices are more likely to reflect the results of skillful approaches to negotiation than historical trends and indications. And success in negotiating mutually beneficial arrangements requires long-term, large-volume commitments by buyers.

Pipelines. Inland transportation efficiencies might also be achieved by the use of pipeline transportation systems — either slurry pipelines or capsule pipelines.

- The technology of **slurry pipelines** consists of grinding coal into a fine powder, mixing it with approximately equal proportions of water (or some other slurry medium — e.g., ethanol, methanol, CO_2, or oil), and pumping it through a pipeline to its destination. At the terminus, the coal and water can be separated* and the coal dried in preparation for burning or transferral to other transportation modes. Or, the slurry mixture can be directly loaded on ships for export, reducing port bottlenecks and permitting deepwater vessels to carry coal from offshore terminals.

- The technology of **capsule pipelines** consists of crushing, cleaning, and drying the coal at the mine and placing it in a plastic capsule or bag containing approximately four tons of coal. The bag (which keeps the coal and water separated for the duration of the trip) has a specific gravity equal to the saline solution in which it floats and which transports the capsule to shipside where it is loaded hydraulically onto tanker-type vessels in the 150,000-200,000 DWT range.

Pipeline transportation could offer an alternative to rail transportation. However, a pipeline will require the movement of a large volume of coal (5 to 10 mty) from a single point of origin to a single point of destination. Once again, the opportunity to achieve substantial savings in the inland transportation component of total price requires long-term, large-volume commitments by buyers.

Sealift. Significant cost-efficiencies can be achieved by moving coal in large, deep-draft bulkers — that is, in vessels of 100,000 DWT or greater.

In general, the unit cost of transporting coal (or any other dry bulk cargo) across the ocean declines with increasing ship size. At the lower end are ships in the 10,000 to 20,000 DWT range. The largest vessels reach 125,000 to 200,000 DWT and are limited only by available harbor depth and appropriate loading equipment design both at origin and destination. As shown in Figure 4, savings approaching 25 percent are achieved in marine

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*A recent study indicated that an alternative is a slurry consisting of 71 percent coal, water, and chemical additives that can be burned without removing the water.

FIGURE 4

AVERAGE ROUND-TRIP VESSEL COST PER CARGO TON
U.S. TO YOKOHAMA

	Voyage Duration (Days)	Vessel Size (1,000 DWT)		
		60	100	150
Puget Sound	32.6	$16.39	$12.61	$ 9.97
Columbia River[1]	33	$18.11	—	—
Northern California[2]	34.2	$17.23	$13.26	—
Southern California	36	$18.18	$13.99	$11.05
New Orleans[3]	62	$33.12	—	—
Hampton Roads[3]	64	$34.17	—	—

Source: CETF. **Report of the Port and Marine Task Group** (Soros Associates, 1981).

[1] The largest grain shipments from the Columbia River ports have been in vessels loaded with approximately 55,000 tons. Therefore, daily costs for a 60,000 DWT ship are allocated to only 55,000 tons of cargo.

[2] Draft restrictions at the San Francisco Bar limit Bay Area shipping to 100,000 to 125,000 DWT.

[3] Panama Canal limits shipments to approximately 60,000 tons.

transportation cost by using 100,000 instead of 60,000 DWT carriers over the more than 4,600 nautical miles that separate Pacific Rim coal users from Australian or U.S. West Coast ports.

The U.S. West Coast has a number of sites which could handle deep-draft bulkers — in the natural deep water of Puget Sound and in dredged channels at Long Beach, Los Angeles, and elsewhere. In fact, both the Long Beach and Los Angeles ports are committed to privately-financed dredging programs that will give them the capacity to handle deep-draft bulkers. However, additional superport capacity — including state-of-the-art coal-handling facilities — can be deployed by expansion or new construction programs only if throughput commitments are sufficiently large in volume (a minimum of five to seven million tons) and long term (at least ten years) to justify an investment in the neighborhood of 100 million dollars (at the rate of $7-$12 per annual ton of throughput). Once again, the long-term, large-volume commitment is key.

Summary. Long land and sea distances and difficult terrain in the western U.S. make transportation the major cost component in the price of a delivered ton of coal in Pacific Rim countries. There are, however, major opportunities to reduce these costs substantially by:

1. negotiating long-term coal haul contracts with the railroads as provided for under the **Staggers Rail Act of 1980**;
2. deploying cost-efficient, dedicated unit trains to replace bulk trains and other coal haul arrangements currently being used;
3. developing pipeline transportation systems — both slurry pipelines and capsule pipelines — to carry large volumes to shipside; and
4. using deep-draft bulkers in the 100,000 DWT class or larger for the marine transportation leg.

The adoption of one or more of these alternatives could result in savings of 15-30 percent on the price of coal delivered CIF to a Pacific Rim buyer. Yet, in each case, the deployment of the cost saving innovation requires long-term, large-volume commitments.

D. THE PACIFIC RIM DEMAND FORECAST

Introduction. If, as it appears, demand is the chicken, then it is important to fully understand the Pacific Rim market* — both the "potential market" and the "expected market." The term **potential market** is used to refer to "total" demand — that is, the highest possible level of market demand, where increased marketing effort would have little effect in stimulating further demand. The term **expected market** is used to refer to the expected level of market demand that will occur given (1) a specified level of industry marketing effort and (2) the characteristics of a given marketing environment — e.g., competition, price, qualitative considerations, market structure, politics, traditions, and others.

The following Pacific Rim demand forecast was developed by the Demand Task Group in collaboration with the Working Groups in each of the Pacific Rim countries participating in the Joint Study. The estimates that follow are based on responses to a questionnaire distributed to the utility, cement, and steel industries, on information gained from discussions with Working Group members in Japan, Korea, and the RoC, and on information from sources in government, trading companies, banks, research centers, and elsewhere.

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*The term "market" is used here to refer to the demand for a product. Thus, market demand for a product is the total volume (of steam coal) that would be bought by a defined customer group (utilities, cement, and steel companies) in a defined geographic area (Japan, Korea, and the RoC), in a defined time period (1980-1995), in a defined marketing environment under a defined marketing program (Kotler, 1976).

FIGURE 5

Forecast of Pacific Rim Demand for Imported Steam-Quality Coal, to 1990 and Estimates of Market Share for U.S. Western Coal*
(In million metric tons — mmt)

	(A) 1981 Total Demand	(B) 1985 Total Demand	(C) 1985 Estimates of Western U.S. Market Share	(D) 1990 Total Demand	(E) 1990 Estimates of Western U.S. Market Share
JAPAN					
Electric Power[1]	3.8	14.5	0.2	40.0-46.0	7.0-10.0
Cement[2]	8.4	10.4	1.1	11.1	1.2
Iron and Steel[3]	4.0	5.0	1.0-2.5	6.0	1.2-3.0
Other[4]	1.7	4.1	0.8	5.9	0-1.2
Subtotal	17.9	34.0	3.1-4.6	63.0-69.0	9.4-15.4
CHINA, REPUBLIC OF					
Electric Power[5]	2.3	6.4-9.8	1.3	11.4-20.4	2.8
Cement[6]	0.5	2.1	0.4	3.8	0.8
Iron and Steel[7]	0	0	0	0	0
Other[8]	1.9	2.1	0.4	2.9	0.6
Subtotal	4.7	10.6-14.0	2.1	18.1-27.1	4.2
KOREA, REPUBLIC OF					
Electric Power[9]	0	7.1	1.8	10.8	2.7
Cement[10]	1.7	3.4-5.1	0.7-1.0	3.4-5.1	0.7-1.0
Iron and Steel[11]	0	0.5	0-0.5	1.0	0-0.5
Other[12]	0	2.1	0.4	3.4	0.8
Subtotal	1.7	13.1-14.8	2.9-3.7	18.6-20.3	4.2-5.0
TOTAL JOINT STUDY	**24.3**	**57.7-62.8**	**8.1-10.4**	**99.7-116.4**	**17.8-24.6**
OTHER PACIFIC RIM COUNTRIES**					
Electric Power[13]	0	6.3	0.3	15.3	0.8
Cement[13]	0.5	1.5	0.1	2.5	0.1
Iron and Steel[13]	0	0	0	0	0
Other[13]	0	0.1	0	0.2	0
Subtotal	0.5	7.9	0.4	18.0	0.9
PACIFIC RIM TOTALS					
Electric Power	6.1	34.3-37.7	3.6	77.5-92.5	13.3-16.3
Cement	11.1	17.4-19.1	2.3-2.6	20.8-22.5	2.8-3.1
Iron and Steel	4.0	5.5	1.0-3.0	7.0	1.2-3.5
Other	3.6	8.4	1.6	12.4	1.4-2.6
GRAND TOTAL	**24.8**	**65.6-70.7**	**8.5-10.8**	**117.7-134.4**	**18.7-25.5**

Note: For sources (numbered notes), see **Report of the Demand Task Group** (Teknekron, 1981).

The estimates of U.S. western steam-quality coal prospects rest on two essential bases: the expectation that Asian consumers will find the prices of these coals to be in the competitive range and that, as a result, they will find it worthwhile to purchase these coals to fulfill a significant proportion of their total coal requirements. See source notes and text for fuller explanation of these estimates in CETF, **Report of the Demand Task Group** (Teknekron, 1981).
** Hong Kong, the Philippines, Singapore, Thailand, and Malaysia.

Potential market demand. Pacific Rim countries are currently using 25 million metric tons of steam-quality coal. Using the methodology described above it appears that total steam coal demand will reach 66 - 71 million tons in 1985 and 118 - 134 million tons in 1990. These results are shown in Columns **B** and **D** of Figure 5.

Expected market. Using the same methodology, it appears that western U.S. steam coal producers can expect a market of 8 - 11 million tons in 1985 and 19 - 26 million tons in 1990. These results are shown in Columns **C** and **E** of Figure 5.

Discussion of the forecasts. While these forecasts represent the best judgments of U.S. and Pacific Rim participants in the Joint Study process, they are surrounded by considerable uncertainty for a variety of reasons.

First, there is the uncertainty related to the general economic situation. In the 1960s and 1970s, the overall energy consumption and electricity consumption growth rates for Pacific Rim countries were generally greater than those experienced in the U.S. Triggered by the unexpected oil price hikes in the 1970s, the world economic situation was drastically changed, as evidenced by high inflation, low economic growth, balance of payment problems, North-South problems, and others. Similarly, efforts to forecast the economic growth rate for the 1980s and associated energy consumption/GNP ratios are constrained by the many unknowns that served to sharply alter expectation during the previous decade.

Second, it is unwise to reach hard and fast conclusions about the coal procurement policies of Pacific Rim countries. In practice, procurement activity is likely to vary considerably as a function of a commitment to achieve a diversification of coal sources on the one hand and considerations of price competitiveness on the other.

At present, Australia is by far the dominant coal supplier in Asia. This appears to be a matter of concern to Pacific Rim power companies, who have indicated that it is wise to reduce their dependence on Australia in order to achieve for themselves a greater security of supply and government-free coal pricing situation. Pacific Rim nations certainly will not wish their dependence on the Middle East for oil to be replaced progressively by dependence on any single source of coal.

Third, the Pacific Rim countries will seek security of supply. Specifically, these countries will want to make sure that their coal-supply sources are reliable. Whereas Australia coal mines have been beset by labor problems resulting in serious supply interruptions, the majority of western U.S. coal production has been free of labor difficulties. Similarly, in their search for security of supply, Pacific Rim nations will pick supply sources that are free from government price interference.

Fourth, future economic conditions will affect construction schedules for both nuclear and coal-fired power plants, increasing the uncertainties that cloud the coal-import forecasting environments in Pacific Rim countries. For these and other reasons, the Pacific Rim demand forecast will vary up and down. Nevertheless, many of the factors operating in the market environment offer a bright prospect for the future of western coal in Pacific Rim markets.

Demand structure. The largest consumer of imported steam-quality coal in 1981 among the Pacific Rim countries will be the cement industry, using roughly 11 million tons, or 44 percent of total Pacific Rim imports. Power companies in 1981 will import approximately six million tons; the iron and steel industry, four million; and other industries, four million.

A major demand shift will soon occur — not just in the magnitude of Pacific Rim import coal use but also in the structure of demand among user industries. This change is also illustrated in Figure 5.

1. Even though cement company imports are projected to double over the period from 1981 through 1990 (comparing the Pacific Rim total for cement in column A, 1981, with the total for cement in column D, 1990), their share of total imports will fall from the present level of 44 percent to between 15 and 19 percent.

2. Electric power company import requirements are expected to rise dramatically, both in absolute terms (from 6 million tons now to between 78 and 93 million in 1990) and in percentage-of-

market terms (from 24 percent to between 58 and 79 percent). The importance of this shift is shown in Appendix F, which displays a plant-by-plant inventory of utility industry demand to the year 2000.

3. The import coal requirements of the iron and steel and other industries (e.g., pulp and paper, chemical, and manufacturing) will rise significantly, but their relative importance in the overall coal-import demand picture will diminish.

Summary. The steam coal market potential in the Pacific Rim is substantial and its structure is changing rapidly:

1. Steam-quality coal imports will rise from the current (1981) level of 25 million tons to between 66 and 71 million tons in 1985 and to between 118 and 134 million tons in 1990.
2. Power companies are emerging as the dominant coal importers, with their current market share of 24 percent rising to between 51 and 59 percent in 1985 and to between 65 and 80 percent in 1990.
3. The potential market demand, large as it is, still represents less than 25 percent of the anticipated production of western U.S. mines for the corresponding years. If the U.S. were to achieve maximum market penetration (e.g., in the 30-40 percent range), it could meet this level of demand with less than ten percent of its projected production for the corresponding years.
4. Many uncertainties surround the demand forecast — including rates of economic growth, the relation between GNP and electricty growth, the pace of conversion to alternative fuels, and others. Nevertheless, owing to the many factors that favor western steam coal (e.g., quality, security, reliability and expandability of supply), the market share of U.S. producers is likely to be rapidly expanded toward the 1990s and thereafter.

E. MARKET EXPANDING ARRANGEMENTS

Procurement decision-making. Procurement decisions nearly always involve a combination of quantitative and qualitative considerations. Price nearly always competes with other non-price economic considerations such as supply stability or other reciprocal relations between buyer and seller. In U.S.-Pacific Rim coal trade, there appear to be a number of these factors operating. These include:

1. Coal quality and related characteristics
2. Security of supply
3. Procurement source diversification
4. Price competitiveness

Issues related to these factors and to less predictable events mean that the size of the actual market share achieved will depend on those specific institutional and physical arrangements which can be made in both the public and private sectors by importers and exporters alike. Favorable arrangements can, in turn, result in increased levels of coal exports.

The development of expanded coal trade and the dynamics of the growth of this trade depend on many interrelated factors which occur over time. Clearly, coal exporters must perceive that a market of suitable size and stability exists and that they will have access to a significant portion of this market as a prerequisite to investment in facilities to mine, move, and ship coal. Also, coal buyers must perceive that potential exporters possess a supply of coal of sufficient quantity and quality to meet their needs and that some assurances concerning stability of supply, price predictability, and/or price competitiveness can be provided.

These perceptions develop over time as a result of both continuing communications between buyers and sellers and an understanding by each of the capabilities and limitations of the other. The process of market development is both continuous and interactive, with the most significant and visible steps (new port or mine construction, signing of long-term contracts) occurring only after many preliminary and less visible actions take place.

Arrangements in the coal export system. A variety of actions can be taken to facilitate the coal export trade between the western U.S. and the Pacific Basin. These actions or arrangements can result in reductions in delivered coal prices to importers, greater efficiency in the export system, greater stability in the western supply infrastructure, a threshold level of capacity that will permit rapid expansion throughout in the event supplies from other sources are interrupted, and increased recognition of the western U.S. as a reliable trading partner. Several such arrangements are identified in Figure 6.

These arrangements can be made by the public or private sectors and can benefit both buyers and sellers of coal. The nature of the arrangements vary substantially and include construction of physical facilities by the private sector; public actions to stimulate coal trade, contractual and financial arrangements, and the deployment of modern materials-handling methods to reduce cost and increase throughput. The arrangements listed in Figure 6 are not intended to be all-inclusive. They do, however, exhibit the range of options available to facilitate coal exports.

Each arrangement or type of action listed can influence one or more of those buyer concerns which are critical to the growth of western U.S. coal exports to the Pacific Basin. These concerns — the delivered price of coal, the capacity of the western U.S. coal supply infrastructure, the stability of western U.S. coal supply, reliability of the U.S. as a coal exporter, and the desire of Pacific Rim users to achieve diversification of supply sources — are presented in Figure 7 along with a listing of arrangements which can have a positive influence on one or more areas of concern.

Many of the arrangements can influence the delivered price of coal through contracting procedures or technological innovations. The same arrangements may tend to strengthen the western U.S. coal infrastructure as a result of upgrading the physical equipment used to mine, move, or load coal. Other arrangements, generally in the public sector, can reduce uncertainty on the part of potential buyers about federal and state policies concerning exports. These arrangements or actions may involve the passage of laws to facilitate coal production for export, the repeal of existing laws which may constrain exports, and the encouragement of foreign investment in the western U.S. coal supply system.

Figure 7

ARRANGEMENTS TO FACILITATE COAL EXPORTS

Participant	Public Sector Actions	Private Sector Actions
Buyers benefit by:	1. Reaffirmation of U.S. policy of non-interference in coal-export trade 2. Facilitation of foreign investment in U.S. through appropriate federal and state laws	1. Construction of new, efficient coal mines 2. Construction of ports designed to reduce materials-handling costs 3. Efficient ship design, including use of deep-draft bulkers 4. High capacity shiploading and unloading systems 5. Rail car design that reduces inland transportation costs 6. Use of unit trains 7. Equity participation in mines and ports/ joint ventures 8. Negotiated rail rates as provided for by Staggers Act 9. Accelerated testing and evaluation of pipeline transportation systems 10. Information to Pacific Rim concerning western U.S. coal production and transportation capabilities
Sellers benefit by:	1. Clear enunciation by Pacific Rim countries of coal import needs, energy growth rates, and policy concerning diversity of supply 2. Expedited channel deepening procedures, by acceleration of the permitting process 3. Repeal or modification of state laws, regulations, or administrative practices that constrain coal exports 4. Expedited mine and port construction, by acceleration of the permitting process	1. Backhauling of cargo on ships 2. Long-term contracts for volumes sufficient to justify capital expenditures 3. Equity participation in mines and ports/ joint ventures 4. Loans from buyers for expansion of new coal export facilities 5. Information to western U.S. producers concerning coal quality/quantity needs and timing

Source: CETF staff analysis.

Fig

ARRANGEMENTS IN THE COAL EXPORT CHAIN

ARRANGEMENT TYPE	PHASE BENEFITED						
	COAL MINING	INLAND TRANSPORTATION	LOADING PORT	SEALIFT	RECEIVING PORT	TRANSSHIPMENT	COAL UTILIZATION
PHYSICAL IMPROVEMENT/ NEW TECHNOLOGY	New and improved production methods or technologies	Unit trains Slurry pipelines Capsule pipelines Railcar design	Faster loading/ unloading	Construction of deep-draft bulkers of 100,000 DWT and larger New ship design: Shallow-draft colliers	Construction of coal terminals with modern storage and handling facilities Rapid ship unloading	Efficient transfer of coal to smaller ships/ rail/barge Efficient storage	Short-term: Advances in technologies related to flue gas treatment and ash disposal. Long-term: Advances in coal combustion: COM, liquefaction, gasification, fluidized bed combustion; use of lower-grade coals
FINANCIAL	Equity ownership of mine by buyer Low-interest loans, from buyer	Ownership or leasing of rail cars by buyer	Use of industrial revenue bonds, federal financing, guarantees, and matching funds Low-interest loans from buyer	Equity ownership by buyer and/or seller	Use of government financing: guarantees, low-interest loans		Joint ventures to develop, test, and evaluate new technologies
CONTRACTUAL	Long-term, large-volume contracts for coal and dedicated mine output	Negotiated rail rates between buyers and railroad as provided by Staggers Act					
LEGISLATIVE	Standardization of coal exporting requirements and procedures Reform of laws or regulations restricting coal export Restraint on taxes on coal mined for export		Expedited channel deepening and port development (loading and receiving) by expedited permitting Continued availability of revenue bonds		Expedite channel deepening		
SYSTEMS	Unit train/port handling integration Pipeline integration at mine and port	Improved capacity via improvements in signalling, trackage, grades, alignments, etc.		Backhauling cargoes			
COMMUNICATION/SOCIAL TECHNOLOGY	Statement of coal export policy Statement of coal import needs More systematic and regularized information exchange between sellers and buyers						Use of lower ranked coals less subject to increasing global demand, thus having greater price stabili'y

Source: CETF staff analysis

exports to the Pacific Rim. These concerns — the delivered price of coal, the capacity of the western U.S. coal supply infrastructure, the stability of western U.S. coal supply, the reliability of the U.S. as a coal exporter, and the desire of Pacific Rim users to achieve diversification of supply sources — are presented in Figure 9, along with a listing of arrangements which can have a positive influence on one or more of those concerns.

Some arrangements, generally in the public sector, can reduce the uncertainty of potential buyers about federal and state policies concerning exports. These arrangements or actions may involve the passage of laws to facilitate coal production for export, the repeal or modification of existing laws which may constrain exports, the encouragement of foreign investment in the western U.S. coal supply system, and the reaffirmation of federal policy to avoid intervention in pricing and contracting decisions.

Other arrangements can influence the delivered price of coal through contracting procedures or technological innovations. The same arrangements may tend to strengthen the western U.S. coal infrastructure as a result of upgrading the physical equipment used to mine, move, or load coal.

3. Procurement Considerations

Procurement decisions nearly always involve a combination of quantitative and qualitative considerations. Price competes with other non-price economic considerations, such as supply stability or other reciprocal relations between buyer and seller. In U.S.-Pacific Rim coal trade, a number of these factors operate. These include:

- Coal quality and related characteristics;
- Security of supply;
- Procurement source diversification; and
- Price competitiveness.

Figure 9

IMPACTS OF ARRANGEMENTS ON COAL BUYER CONCERNS

Arrangement /Action Affecting Coal Exports	Coal Buyer Concerns			
	Delivered Price	Strength of Infrastructure	Reliability of U.S. as Supplier	Diversity of Supply
1. Clear enunciation by Pacific Rim countries of coal import needs, energy growth rates, and policy concerning diversity of supply		X		X
2. Clear U.S. policy supporting coal export			X	X
3. Facilitation of foreign investment in U.S. through appropriate federal and state laws	X	X		
4. Expediting of channel deepening procedures	X			X
5. Repeal of any state laws limiting or prohibiting coal exports			X	
6. Limitation of state sales or severance taxes for coal mined for exports	X		X	
7. Expediting of mine and port construction		X	X	
8. Construction of new, efficient coal mines	X	X		
9. Construction of ports designed to reduce materials-handling costs	X	X		
10. Efficient ship design	X	X		
11. High capacity shiploading and unloading systems	X	X		
12. Rail car design that reduces inland transportation costs; use of unit trains	X	X		
13. Pacific Rim equity participation in mine and port/joint ventures	X	X		X
14. Negotiation of rail rates with railroads	X			
15. Information to Pacific Rim concerning western U.S. coal production and transportation capabilities		X	X	
16. Backhauling of cargo on ships	X			
17. Long-term contracts for volumes sufficient to justify capital expenditures	X	X		
18. Loans from buyers for expansion of existing and new facilities		X		
19. Information to U.S. producers concerning coal quality/quantity needs and timing		X		

Source: CETF staff analysis.

The development of expanded coal trade and the dynamics of the growth of this trade depend on many interrelated factors occurring over time. Clearly, coal exporters must perceive a market of suitable size and stability and access to a significant portion of this market, as a prerequisite to investment in facilities to mine, move, and ship coal. Also, coal buyers must perceive that potential exporters possess a supply of coal of sufficient quantity and quality to meet their needs and that some assurances concerning supply stability, price predictability, and/or price competitiveness can be provided.

These perceptions develop over time as a result of both continuing communications between buyers and sellers and an understanding by each of the capabilities and limitations of the other. The process of market development is both continuous and interactive, with the most significant and visible steps (new port or mine construction, signing of long-term contracts) occurring only after many preliminary and less visible actions take place.

Long-Term, Large-Volume Contracts. To the extent that delivered cost is a major concern of importers, long-term contracts for coal deliveries in volume can help alleviate these concerns. Cost savings resulting from physical improvements and other arrangements can be estimated, and these savings — expressed in terms of a lower delivered price — can be shared by coal purchasers through appropriate contractual terms. Such contracts may be necessary if the buyer is to commit to receiving coal from a supply structure that may not yet be fully in place but which can be developed, given the guarantee of coal sales expressed in long-term contracts.

For the seller, the contract must be for a sufficient volume of coal delivered over a sufficiently extended period to recover the capital costs of developing the mining facilities needed and to obtain an adequate return on investment.* For the buyer, the timing and volumes must accommodate the deployment of new technologies and methods and the achievement of economies of scale that can be reflected in delivered prices.

A major benefit of long-term, large-volume contract purchases lies in greater assurance of supply to the importer and greater production stability for the exporter. Moreover, international contracts can be consummated in a variety of ways. Two basic approaches are (1) the cost-plus contract, which includes a base price FOB mine that provides an acceptable profit to the producer and appropriate escalation formulas to ensure continuation of the agreement, and (2) the world-market price contract, in which the FOB mine price for a fixed amount of coal is adjusted at intervals, based on the price at which comparable coal is available elsewhere. The actual contractual provisions used can affect the degree of price security available to both buyers and sellers (Zinder-Neris, 1981) and the establishment of harmonious and mutually beneficial coal trade.

Transportation Contracts. As regulated common carriers, railroads in the United States have traditionally had their rates set by the Interstate Commerce Commission (ICC), with users paying published rates or tariffs. However, this situation changed with passage of the **Staggers Rail Act of 1980**, under which federal rail regulatory policy was substantially altered.

Under Section 208 of the Staggers Act, railroads and producers may now contract for rates, quality of service, and conditions of service for specified periods.** The ability to negotiate coal shipment contracts substantially changes the relationship between railroads, coal producers, and the ICC.

Under the Staggers Act, coal users or producers and railroads can negotiate railroad rates that reflect reasonable coal transportation costs.

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*That is why, for example, utility demand is an important key to expanded coal trade: utilities (as shown in Appendix L) represent long-term, stable, large-volume requirements for fuel and, thus, the needed investment capital.

**Details of Staggers Act provisions are summarized in the Technical Report on Overland Transportation.

This approach is probably most useful in the early stages of sales contract negotiations, where equivalent sources of supply from more than one producing area, each served by a different rail carrier, are being considered. The railroad user can thus compare the coal prices offered FOB mine and compare and negotiate the overland transportation rates from the mines to ports.

Equity Participation. In addition to long-term purchase commitments, direct equity participation by coal importers in the U.S. coal supply system is a way to achieve stability of supply and to expedite the development of cost-efficient export facilities in the U.S. This participation will most likely take the form of partial mine ownership, ownership of rail cars, and/or development and part ownership of new port facilities.

While such ownership may result in reduced coal prices, the primary benefit obtained by importers should be the increased control over the flow of coal in the export chain. Ownership in mines brings with it increased knowledge of the quality of the coal produced and of local labor and mining conditions. Equity in ports may result in more expeditious loading of coal ships and in reduced loading costs.

In general, while U.S. policy has remained neutral towards direct foreign investment, capital investment in the U.S. is nevertheless encouraged. For example, the U.S. Department of Commerce (DOC) has organized several programs designed to inform foreign investors about U.S. business regulations and to encourage foreign investment — particularly in economically depressed regions in the U.S. The U.S. central government maintains a liberal posture on foreign investment. Moreover, many states actively encourage investment through tax incentives, bond issuance, and low-interest loans. Although some states restrict property ownership by foreign persons, there are no such restrictions on joint ventures, equity participation, or on U.S. corporations that are majority foreign-owned.

In addition to equity participation, development of the coal export chain can also be supported by importers who provide loans to develop mines, ports, and rail facilities where necessary. Such loans may or may not reduce delivered coal prices or increase the assurance of supply;

however, they do demonstrate a commitment by the purchaser to the development of the coal export infrastructure, a commitment which can expedite both the time and cost required to bring facilities to completion. Also, apart from the importers' anticipated need for coal, such loans may represent a productive use of capital, compared to the risks and returns associated with other loan opportunities.

4. Technological Arrangements

A number of technological arrangements can, through lower costs and increased materials-handling capabilities, increase the attractiveness of western U.S. coal to Pacific Rim importers.

Because the implementation of these arrangements is generally predicated on substantial quantities of coal being mined and transported, many of the facilities are not yet in place, including those described earlier: unit trains, modern deep-draft ports, modern coal-handling equipment and procedures, deep-draft bulkers of 100,000 DWT or larger, and coal slurry pipelines.

5. Timing Considerations

Coal export chains linking the western U.S. to Pacific Rim users currently move quantities of coal (about five million tons in 1981) from mines in the Rocky Mountains to Pacific Rim users via California ports. If this volume is to increase over the next ten years, new physical, contractual, financial, and other arrangements appropriate to the expanded volume will have to be made.

Two elements of timing are noteworthy: (1) the **sequence** of actions taken in the public and private sectors of both exporting and importing countries; and (2) the **length of time** required to implement the arrangements.

Sequencing was cited earlier as the "chicken and the egg" problem, where both buyer and seller wait for the other to take an initial action. In reality, the development of coal trade is more complex than a single sequential set of actions, first by one party and then by the other.

Driving forces in the growth of a western U.S.-Pacific Rim coal trade are (1) actual growth in coal demand among Pacific Rim countries, (2) the desire by importers for a diversity of suppliers, (3) the need for reliable sources of supply, and (4) the need for cost-competitive supply sources. In response to these forces, simultaneous actions, such as spot market contracts for steam coal exports, announced port expansion plans, and information exchange concerning coal quantity and quality needs and availability are currently taking place. At some point, however, new arrangements involving substantial capital investment must be made if the coal trade is to grow. The sequencing of these arrangements depends on the lead times involved in the design and construction of facilities.

Figure 10 presents representative lead times for facility or hardware acquisition at each phase of the export chain. For coal use in electric utilities (by far the largest market segment), the most critical element is the time involved to site, permit, design, and construct a power plant. If the growth in demand for coal is a result of growing utility demand, and if long-term contracts for this coal are signed with western U.S. producers, (where the permitted coal supply is already available), the entire domestic supply infrastructure can be put in place within the lead time required to site and construct power plants.

6. Summary

A variety of arrangements can be implemented to expedite the process and reduce the cost of coal exported from the western U.S. to the Pacific Rim. These arrangements can involve various combinations of facility additions and improvements, financial participation by coal importers, coal purchase contracts, and legislative actions. They can be used to accelerate the timing of facility development and to demonstrate long-term buyer commitment to western U.S. coal purchases. They can also increase the buyer's knowledge of and control over critical elements in the coal export chain and thus increase supply reliability. The specific nature of the arrangements depends on the buyer's interest in becoming involved in the technology of coal production and transportation, the magnitude of his investment, and his coal import policy objectives.

Figure 10

LEAD TIME REQUIREMENTS FOR COAL CHAIN DEVELOPMENT

	Lead Times
Mines	72 - 120 months
Railroad improvements	6 - 24 months
Trackage Signalling Rolling stock Locomotives	
Export terminal facilities	30 - 60 months
Coal collier/bulk carrier	20 - 24 months
Import terminal facilities	30 - 60 months
Coal-using facilities: electricity	72 - 144 months
Coal-using facilities: cement	6 - 24 months

Source: Staff analysis based on data in CETF Technical Reports.

F. CONCLUSION

The findings of this Joint Study demonstrate the feasibility and mutual benefits of expanded steam coal trade between the western U.S. and Pacific Rim countries. Western mines are productive and competitive. Among their numbers, they can offer high-quality steam coal in whatever quantities may be needed.

The railroad system in the West has the line, financial, and general management capacity to carry coal in any volumes that might be required by Pacific Rim users to any port on the West Coast. Moreover, a number of opportunities exist for reducing the cost of rail transport, including the possibility of negotiating long-term contracts with railroads as provided for under the Staggers Rail Act of 1980, of using cost-efficient unit trains, and of developing and deploying efficient coal pipeline transportation systems.

West coast ports can handle present volumes of coal trade, and the expansion of capacity already underway at presently operating facilities will be adequate to handle short-term increases in volume. In the longer term, port sites being planned offer a range of physical, environmental, and overland access alternatives for accommodating substantially expanded trade.

Finally, the United States federal government has traditionally maintained a hands-off approach to coal export negotiations while at the same time favoring expanded coal trade. State and local governments also generally regard international trade as good for the economies of their localities. Moreover, Pacific Rim cement, steel, and particularly utility companies have a strong interest in expanding their steam coal imports and diversifying their sources of supply.

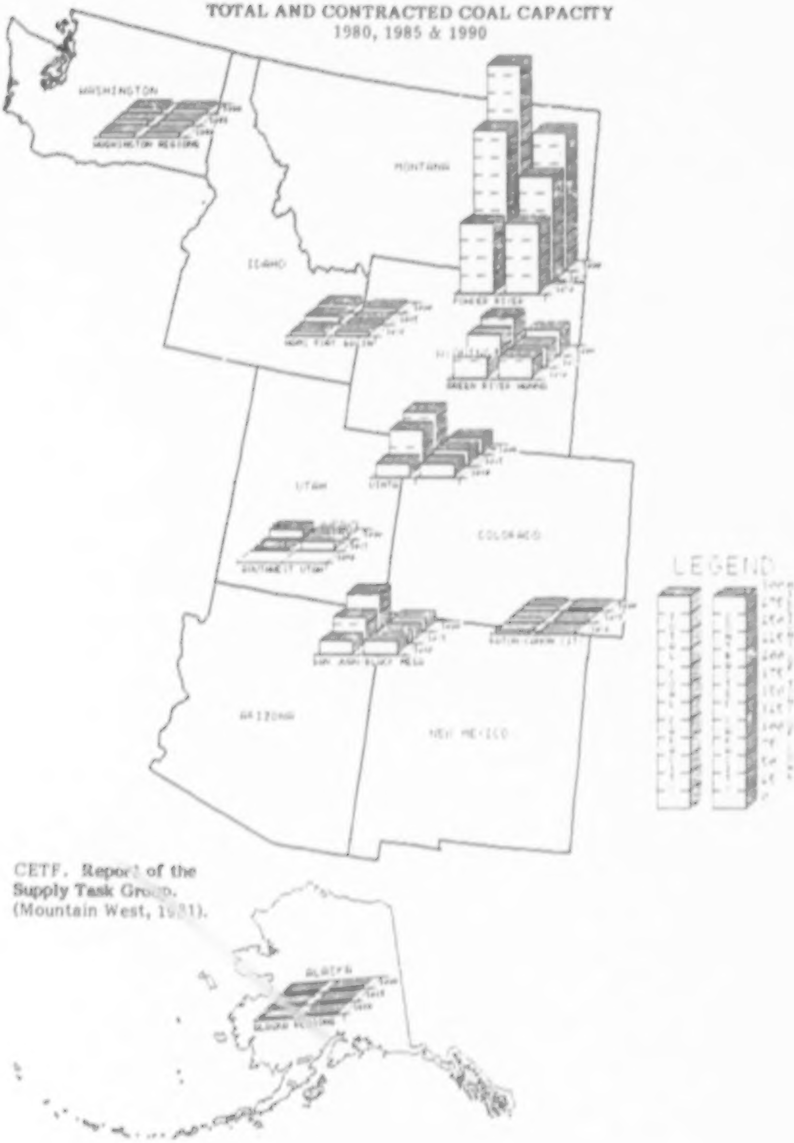
If adequate capacity is to be on line in the mid- to late eighties, steps must be taken now by both buyers and sellers. Lead times for planning and constructing facilities, particularly ports and utility plants, dictate near-term action.

Producers, transporters, and users of western U.S. steam coal need not and should not wait upon the other to make the first commitment. Indeed, no one set of interests would be well-served by unilateral decision-making by other interests. Cost-effective expansion of Pacific Rim coal trade depends on good faith, cooperation, and well-timed coordination. Capacity must grow apace in all sectors of the coal chain — production, inland transportation, port loading, marine transport, unloading, and end-use. Negotiations about price and volume should take the long-term view, because sound development of expanded coal trade necessarily is a long-term undertaking.

Decisions made by investors and others on both sides will be one measure of the accuracy and timeliness of the study findings and conclusions. In the meantime, the study process itself — in which buyers and sellers worked together to dispel commonly held myths and clarify widespread uncertainties — opened the disciplined dialogue that fosters the mutual respect and understanding that is a prerequisite for sound business decisions.

Appendix G

TOTAL AND CONTRACTED COAL CAPACITY
1980, 1985 & 1990



Source: CETF. Report of the Supply Task Group. (Mountain West, 1981).

Appendix II

PRODUCTION, CAPACITY AND COAL UNDER CONTRACT FOR 1980,1985, AND 1990 FOR SELECTED COAL REGIONS IN THE WESTERN U.S.

	1980	1985			1990		
	PRODUCTION (MILLION TONS)	CAPACITY (MILLION TONS)	CONTRACTS (MILLION TONS)	%	CAPACITY (MILLION TONS)	CONTRACTS (MILLION TONS)	%
ALASKA	.8	1.5	1.5	100	1.5	1.5	100
POWDER RIVER	97.5	222.4	146.7	66	304.4	181.7	60
GREEN RIVER-HANNA NORTH PARK	29.5	40.2	30.6	76	47.9	36.5	76
HAMS FORK	5.0	8.0	4.7	59	10.0	4.4	44
UINTA	19.6	49.6	21.9	44	64.6	22.9	35
S.W. UTAH	0	1.9	1.3	68	12.2	11.5	94
BLACK MESA	11.0	12.0	12.0	100	12.0	12.0	100
SAN JUAN	17.6	30.7	14.0	46	50.0	14.0	28
RATON-CANON CITY	2.5	4.5	2.5	56	4.5	2.5	56
WASHINGTON	5.1	6.3	4.8	76	6.3	4.8	76
OTHER	.4*	—	—	—	—	—	—
TOTAL	189.0	377.1	240.0	64	513.4	291.8	57

Source: CETF. **Report of the Supply Task Group.** (Mountain West, 1981).

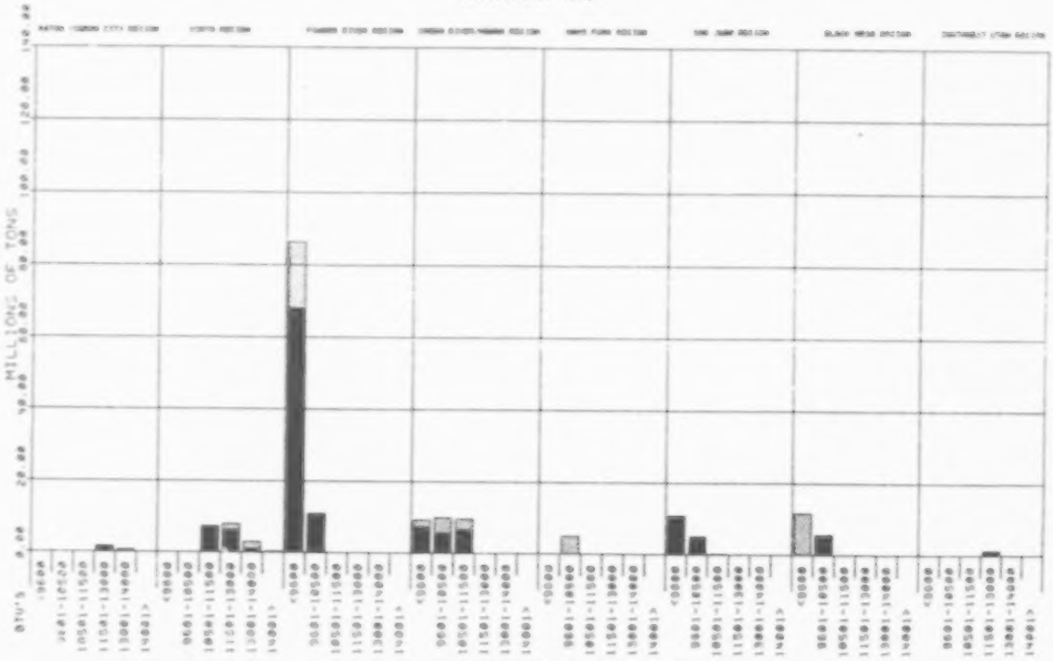
*Includes 302,000 tons of Montana production and 123,000 tons of Colorado production outside the study area.

Appen

COAL CAPACITY BY BTU QUALITY AND SULFUR CONTENT
Western Coal Regions

1980

(millions of tons)



Source: CETF. **Report of the Supply Task Group.** (Mounain West, 1981).

Appendix J

FEATURES OF SITES FOR PLANNED WEST COAST COAL HANDLING FACILITIES

Site	Channel Depth (existing)	RR Service*	Acres Available	Air Quality Status**
CALIFORNIA (10)				
Long Beach	60 ft (18 m)	SF,SP,UP	100+	Non-A/tsp,A-SO_2
Los Angeles	45 ft (14 m)	SF,SP,UP	190 (fill)	Non-A/tsp,A-SO_2
Port Hueneme	35 ft (11 m)	SP via Ventura Co. RR	60+	Non-A/tsp,A-SO_2
Port of Redwood City	32 ft (10 m)	SP	10 (phase 1) 200 (ultimate)	A
Port of San Francisco	50 ft (15 m)	SP	70	A
Port of Richmond	35 ft (11 m)	SF,SP	NA	A
Selby (Wickland Oil)	35 ft (11 m)	SP	308	A
Benicia	35 ft (11 m)	SP	150	A
Sacramento	32 ft (10 m)	SP,WP	10 (phase 1) 300 (ultimate)	A
Stockton	32 ft (10 m)	SF,SP,WP	73	Non-A/tsp,A-SO_2
OREGON (4)				
Coos Bay	35 ft (11 m)	SP	70	A
Warrenton	40 ft (12 m)	BN	130	A
Astoria	40 ft (12 m)	BN		A
Port Docks			75	
Tongue Point North			55	
Skipanon			150+	
Portland	40 ft (12 m)	BN,SP,UP	110	Non-A/tsp,A-SO_2
WASHINGTON & ALASKA (12)				
Grays Harbor	30 ft (9 m)	BN,UP	176	A
Vancouver	40 ft (12 m)	BN,UP	100-160	Non-A/tsp
Kalama	40 ft (12 m)	BN,UP	175	A
Longview	40 ft (12 m)	Longview Switching	325	Non-A/tsp,A-SO_2
Dupont	80+ (24 m)	BN,UP	3,200	A
West Tacoma (Lone Star)	80+ (24 m)	BN,UP	100	A
Tacoma	80+ (24 m)	BN,UP	90+	Non-A/tsp,A-SO_2
Everett	80+ (24 m)	BN	1,800	A
Possession Sound (Tulalip)	80+ (24 m)	BN	1,300	A
Anacortes	80+ (24 m)	BN	NA	A
Bellingham	80+ (24 m)	BN	1,000	A
Seward, AK	80+	AR	100-500	A

Source: Western Coal Export Task Force (CETF) Port Questionnaire. See CETF. **Report of the Ports and Marine Task Group.** (Soros Associates, 1981).

NA = Not Announced

*Railroads:

AR = Alaska Railroad	SF = Atchison,Topeka,& Santa Fe	UP = Union Pacific
BN = Burlington Northern	SP = Southern Pacific	WP = Western Pacific

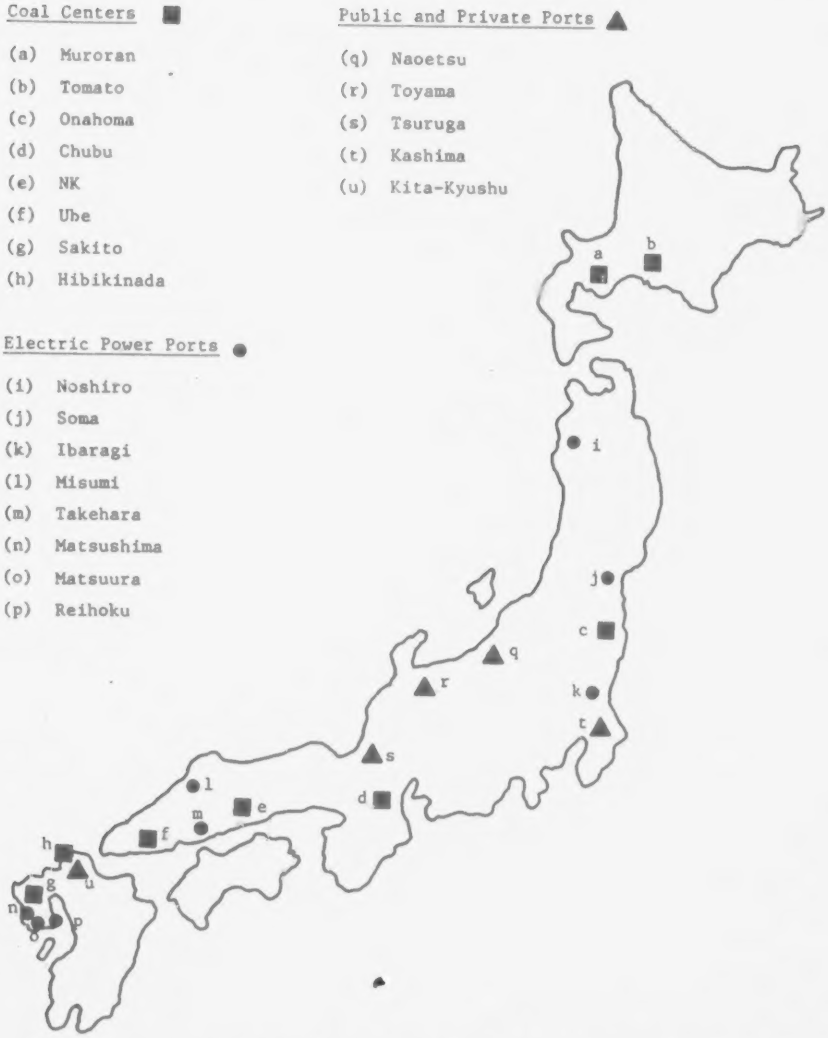
**Source of air quality status is Phil Nelson, Air Quality Engineer, Washington Department of Energy.

A = Attainment areas meet (attain) enforced federal air quality standards for total suspended particulate (tsp) and SO_2.

Non-A = Nonattainment areas have air degradation in excess of minimum federal air quality standards.

Appendix K1

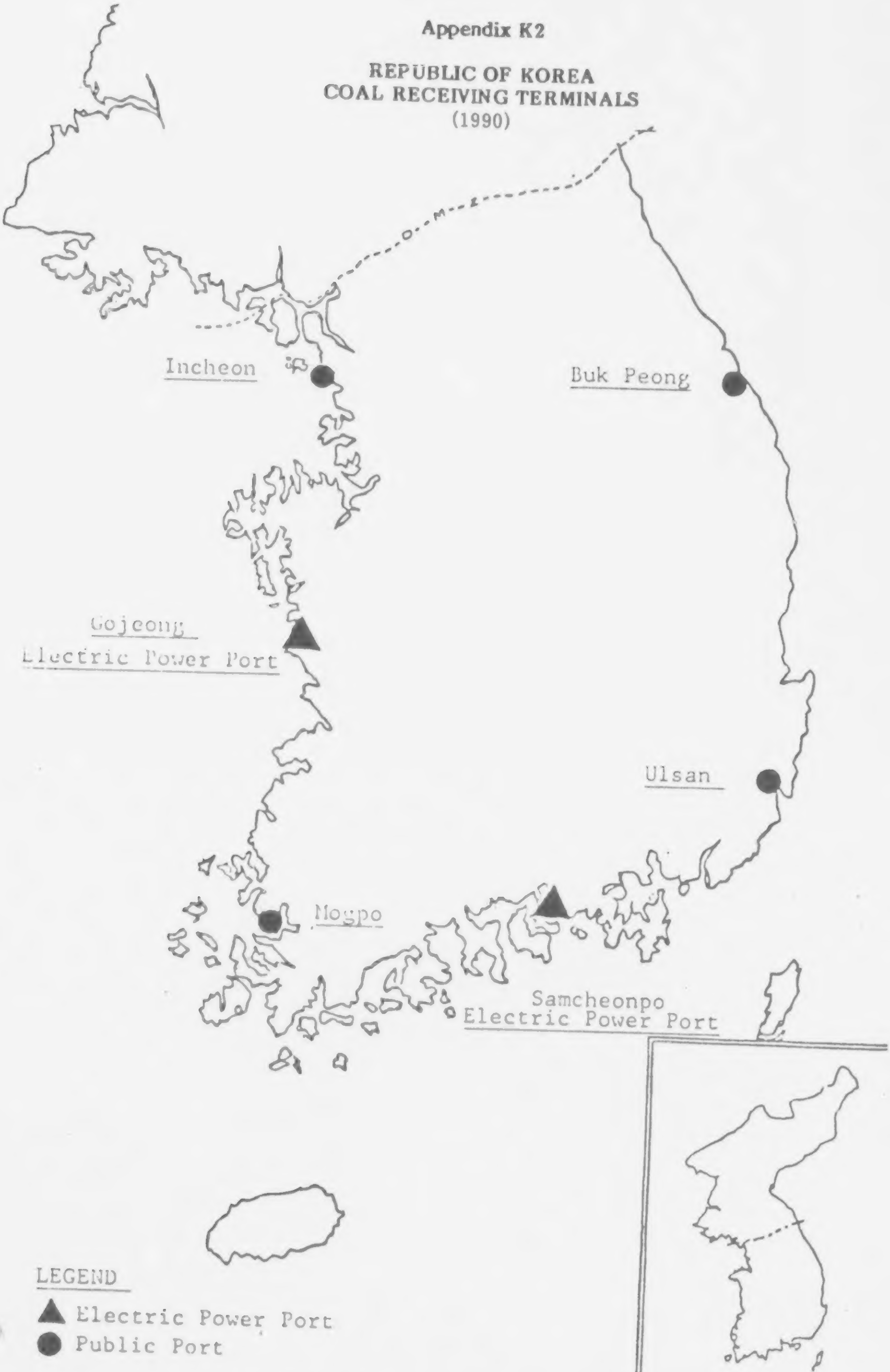
JAPANESE COAL RECEIVING TERMINALS
(1990)



Source: CETF. **Report of the Port and Marine Task Group.** (Soros Associates, 1981).

Appendix K2

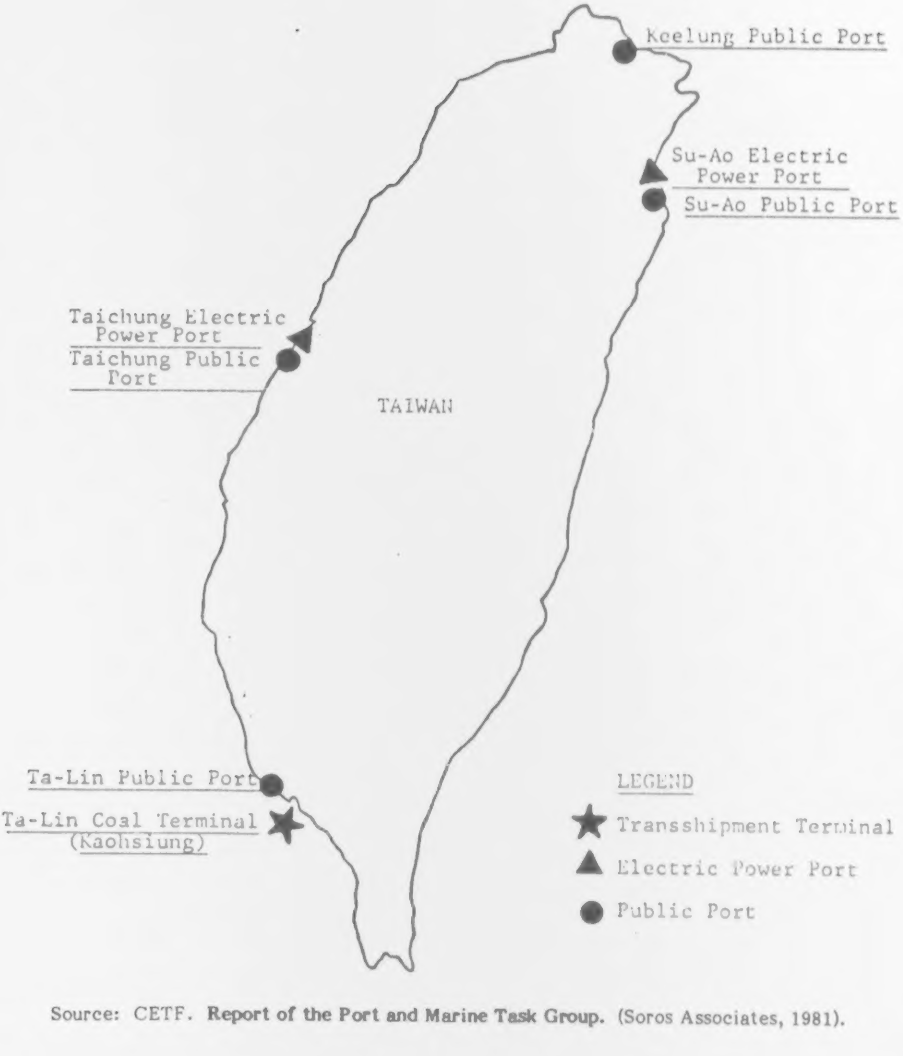
REPUBLIC OF KOREA COAL RECEIVING TERMINALS (1990)



Source: CETF. **Report of the Port and Marine Task Group.** (Soros Associates, 1981).

Appendix K3

TAIWAN COAL RECEIVING TERMINALS
(1990)



Source: CETF. **Report of the Port and Marine Task Group.** (Soros Associates, 1981).

Appendix L

PACIFIC RIM UTILITY DEMAND

Timing, Volume, Market Share
for JAPAN, KOREA, TAIWAN

Based on Plant-by-Plant Inventory

	1985	1990	1995	2000
Facilities Using Imported Steam Coal (Japan, Korea, Taiwan)	43	68	88	99
Megawatts Generated From Imported Steam Coal[*]	18,680	36,386	52,767	71,067
Utility Industry Demand for Imported Steam Coal	34.72	72.76	108.71	150.50
Steam Coal Volume Exported to Pacific Rim Utility Industry at:				
40% Market Share[#]	13.88	29.10	43.48	60.20
30% Market Share	10.41	21.82	32.61	45.15
25% Market Share	8.68	18.19	27.17	37.62
20% Market Share	6.94	14.55	21.74	30.10
15% Market Share	5.20	10.91	16.30	22.57

Source: Staff Analyses based on the **Report of the Demand Task Group.** (Teknekron, 1981) and on interviews and site visits in Japan, Korea, and Taiwan.

[*] All coal is designated in million-ton volumes.

[#] As shown in this section, utility demand is one important key to expanded coal trade between the western U.S. and Pacific Rim nations. This is the case because utility demand represents long-term, stable, large-volume trade — the kind of commitment that is required to trigger the investments needed to deploy innovations in transportation systems to achieve cost-efficiencies in the coal chain that will help make U.S. coal more cost-competitive on a delivered BTU basis.

Appendix M
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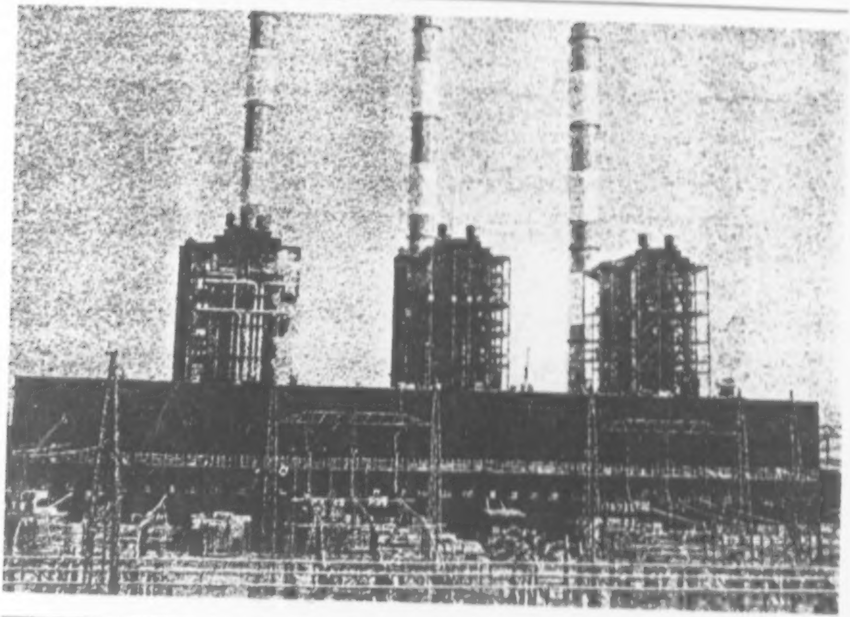
2. Demand Task Group



Western Coal Export Task Force

Western Steam Coal Exports to the Pacific Basin: Demand Task Group

Prepared by the Demand Task Group
Western Coal Export Task Force-
Pacific Basin Steam Coal Export Study

Technical Assistance by
Teknekron, Inc.

December 1981

Under the auspices of the
Western Governors' Policy Office (WESTPO)
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FOREWORD

The release of the reports of the Western Coal Export Task Force (CETF)-Pacific Basin Steam Coal Export Study marks the culmination of a joint effort between buyers and sellers and between U.S. industry and state government. The goal of this effort has been to expand opportunities for long-term, large-volume steam coal trade between the western U.S. and Pacific Basin countries, principally Japan, the Republic of China (Taiwan), and the Republic of South Korea.

With this goal as a guide, the Western Coal Export Task Force, organized under the auspices of the Western Governors' Policy Office (WESTPO), cosponsored this joint study with coal-using industries in the three principal Pacific Basin countries.

The primary objective of the study has been to provide a comprehensive assessment of demand in key Pacific Basin markets and of the production and transportation capacity of western coal-related industries to export coal from the western United States to those markets. That objective, I believe, has been accomplished, and with a high degree of quality. We have produced the single most comprehensive compilation of information on western coal production, related transportation systems, and Pacific Basin markets.

The less tangible results of the study are no less significant:

1. Coal producers, railroad executives, and port developers; state government; buyers; environmental leaders; and specialists in natural resources, transportation, law, marketing, and other fields together contributed their thinking to a common product.
2. As a result of the Task Force, more U.S. companies are involved in coal exports and optimistic about its prospects. I view this as an outcome that will help promote the health and vitality of the western coal industry.
3. The confidence of Pacific Basin business and government leaders in the western U.S. as a stable, responsible trade partner has been strengthened.
4. Both U.S. exporters and Pacific Basin coal users see better the value of trade between our two regions — not only in coal but in other commodities as well.

The relationships and processes developed during the joint study can serve as the basis and model for continuing cooperation between western governors and industry leaders, and between the western U.S. and the Pacific Basin region in matters related to trade and international market development.

On behalf of my fellow governors who served on the Western Coal Export Task Force Steering Committee and of the western business leaders who served on our Policy Liaison Group, I am pleased to present this report. I am also pleased to have participated in this unique effort to strengthen public-private, interstate, and international relationships while advancing the interests of all involved to expand the use of coal as an energy source and thereby reduce our dangerous reliance on imported petroleum from unstable areas.

Scott M. Matheson
Governor of Utah
Chairman, Western Coal Export Task Force

PREFACE

A. BACKGROUND AND PURPOSE

In October 1980, in the offices of Utah Governor Scott M. Matheson, western U.S. industry leaders formed the Western Coal Export Task Force (CETF) under the auspices of the Western Governors' Policy Office (WESTPO). The Western CETF brings together coal producers, railroad executives, and West Coast port developers with governors of the western states in a common purpose: to foster long-term, large-volume steam coal exports to Pacific Basin markets. The Western CETF resulted from a year of intensifying interest by both steam coal exporters in the western U.S. and buyers in the Japan, South Korea, and Republic of China utility, cement, and steel industries in working out together, in a disciplined forum, ways and means of increasing coal trade opportunities.

In early 1981, the Western CETF proposed a study to be jointly sponsored with coal-using industries in the Pacific Basin. The purpose of the joint study was to try to resolve what came to be described as the "chicken and the egg problem" — that is, Pacific Basin steam coal users are hesitant to consider long-term, large-volume contracts without the assurance that adequate production, inland transportation, and port-handling capacity will be developed, while U.S. mine, railroad, and port operators and developers are reluctant to invest in such facilities until long-term contracts have been signed. The approach of the joint study was to collect, verify, consolidate, and synthesize information related to these issues — information that business could then use, if it chooses, in making business decisions that will trigger a long-term, stable coal trade. A less tangible but no less significant purpose is to provide a forum for consensus-building on both sides about the issues and actions that can impede or facilitate coal trade.

Formal agreements were consummated with the Japan Coal Development Company (JCD), Taiwan Power Company, and Korea Electric Company (KECO) in early 1981, and the Western CETF-Pacific Basin Steam Coal Export Study was initiated in June 1981.

The Western CETF was charged by its U.S. sponsors and its Pacific Basin counterparts with submitting its preliminary findings on supply and demand in U.S.-Pacific Basin coal trade in September 1981 and its final report by December 31, 1981 (see Appendix C for the joint study charter).

B. STUDY APPROACH AND METHODOLOGY

In approaching the task of developing a framework of information on coal exports, the Western CETF divided into five main industry task groups, studying market demand, coal supply, overland transportation, ports and marine transportation, and institutional/regulatory factors.

Each task group was headed by a leader from one of the principal coal export industries: coal producers, railroads, and ports. Executives from these industries were joined by state government officials to constitute the working members of the task groups. Each task group was assisted by a technical associate. See Appendix D for task group membership rosters.

The study methodology included:

1. **Literature reviews.** Each task group refined the key questions and identified, assembled, and integrated previously published information addressing those questions.
2. **Surveys.** Formal survey instruments were developed for U.S. ports, receiving ports, and coal-using facilities, including utility, cement, and steel plants in Japan, South Korea, and the Republic of China. The survey of western U.S. ports inventoried

physical features, such as water depth, available acreage, and rail access; environmental considerations; and expansion or construction plans. The survey of coal-using facilities solicited data on characteristics such as generating or productive capacity, coal quality specifications, construction or conversion plans, commission dates, and environmental considerations. The survey of receiving ports was designed to assess the compatibility of physical specifications and timing of construction plans of those facilities with the planned facilities on the West Coast of the U.S.

3. **Interviews.** Unstructured interviews of top and middle management and technical personnel in industry and government were conducted. Information gleaned from these interviews was aggregated as appropriate and the discussion of issues reflects a variety of opinions and views. Interviews were also used to validate or otherwise evaluate data from other sources.

4. **Aggregate data analysis.** Data compiled by the western states and the U.S. Department of Energy (DOE) for the Western Coal Survey, and by Keystone for the Keystone Coal Expansion Survey were subjected to secondary analysis in order to develop estimates of the western U.S. coal supply. Western states' data included New Mexico's Energy Resources (1980), Utah Energy Department: 1981-1990, and the Wyoming Minerals Development Monitoring System. The resulting profiles were subsequently assessed and validated via interviews of industry and state government officials.

5. **Computer compilation and graphics.** Data on coal supply were entered into a data base in order to compile, aggregate, and graphically present information on coal supply. Bar graphs, city scapes, and mine-by-mine readouts were generated for the major coal basins of the West.

6. **Site visits and overflights.** Task group members and technical associates visited coal producing, transporting and consuming facilities on both sides of the Pacific. Delegations to Japan, South Korea, and the Republic of China (RoC) visited utility, cement, and steel plants, as well as existing receiving coal terminals and sites of planned facilities. On the U.S. side, task group members visited coal mines and ports, participated in overflights of coal production areas and port basins, and traveled on rail routes that transport coal.

7. **Review and approval.** Drafts of all reports were subjected to extensive review by industry participants (including both policy and technical personnel), state agency staffs, national environmental leaders, and representatives of Indian tribal councils. The reports reflect their comments and suggestions. All reports were formally reviewed and approved by the Policy Liaison Group, which is the board of directors of the Western Coal Export Task Force.

The result of these activities is a set of reports that covers physical, political, economic, environmental, technological, and institutional factors affecting coal trade.

C. THE STUDY REPORTS

The findings of the study are contained in a set of six reports, Western U.S. Coal Exports to the Pacific Basin covering the full scope of the study.

1. Volume 1, **Final Report**, summarizes and synthesizes an extensive range of information on coal markets, production, and transportation, gleaned from the technical reports produced out of the joint study process. It draws implications to coal trade of the most critical factors and details concrete options for triggering substantial coal trade between the western U.S. and Pacific Basin countries.

2. Volumes 2 through 6 are **Technical Reports** which present detailed information compiled, validated, and synthesized by each of the Industry Task Groups.

   a. Volume 2, **Report of the Demand Task Group**, details Pacific Basin markets for western steam coal — principally in Japan, the Republic of China, and the Republic of South Korea. It includes quantity, type, and quality specifications; timing of need; committed and uncommitted volumes; technological changes influencing decisions; and share for western U.S. suppliers. The Demand Task Group drew its information from official reports in each country as well as from informal analyses by banks, trading companies, research institutes, and others. The Task Group also synthesized the results of discussions with Pacific Basin industry executives — including the utility, cement, and steel industries — and government agency officials.

   b. Volume 3, **Report of the Supply Task Group**, inventories western U.S. mines and discusses factors influencing coal production. It includes production capacity; quality specifications; location; timing of availability; and quantities committed to contract. It covers all the major coal fields in the West. The report aggregates this information by coal basin while also supplying mine-specific data in appendices and maps. Regulatory, permitting and institutional factors affecting western resource availability and productivity are also laid out.

   c. Volume 4, **Report of the Overland Transportation Task Group** profiles each of the western railroads that are patented carriers of export coal — including an analysis of line capacity; grades; alignment; and related factors. The role of trucks, barges, and slurry pipelines is also considered. Information is also included on mine mouth links (truck, rail, or other), rail system capacity by line segment, and rail-port links, including the number of at-grade crossings on approaches to port sites. It also covers physical and environmental constraints, potential for expansion and upgrading, lead times for expansion, tariffs, rail car and coal slurry technologies, and trucking and barging options. The report includes maps that lay out in detail the routes of each railroad.

   d. Volume 5, **Report of the Port and Marine Task Group**, sets forth considerations and options in developing coal ports on the West Coast of the U.S. It includes information on the size, configuration, and ownership of the present and planned world bulk vessel fleet, as well as factors affecting the cost and efficiency of sealift transportation alternatives — including Panamax and VLCCs. The report also covers capacity and timing of development for receiving ports, synthesized from research and discussions with industry and government officials in Japan, South Korea, and the Republic of China. The physical and environmental aspects of announced plans to expand West Coast port capacity, capital and operating costs, and lead times for port expansion are also covered. The report includes marine charts and aerial photographs of the 26 planned West Coast port sites.

   e. Volume 6, **Report of the Institutional/Regulatory Task Group**, highlights the most relevant features of the regulatory and institutional climate affecting coal exports in the western U.S. It includes factors influencing joint venture arrangements and foreign investments; coal leasing laws; regulations affecting coal production and transportation, such as surface mining, air quality, and coastal zone management regulations; manpower, health, and safety factors; and legislative initiatives. The report draws on the expertise of specialists in industry, government, the law, and the social and management sciences.

D. FUNDING

Funds for the joint study were provided by industry sponsors in the four participating countries. In the U.S., the contribution of the Western Coal Export Task Force (CETF) came entirely from its industry members — coal producers, railroads, ports, and port developers. (See Appendix A for the roster of Western CETF members). In the Pacific Basin, the Japan Coal Development Company (JCD), Taiwan Power Company, and Korea Electric Company (KECO), contributed matching amounts under parallel but separate agreements with the Western CETF.

E. CONCLUSION

This study is not designed to make business decisions. It does not recommend specific mines, railroad routes, or port sites. Yet, investment decisions are needed today and over the next 36 months for steam coal trade five years from now. Therefore, the study has compiled, verified, and synthesized information for business and government to use, if they choose, in making decisions that will effect that coal trade.

The joint study process has established in both the U.S. and Pacific Basin an appreciation of the opportunities and challenges that are inherent in a mutually beneficial steam coal trade. The joint study process has served as a point of contact for foreign representatives to obtain information and register concerns. The joint study has served as a public forum for expressing views on both sides about problems that must be solved to implement large-volume, stable steam coal trade. The joint study has also served as a clearinghouse for innovative ideas from both industry and government.

We hope the study results and relationships developed during the study process can contribute even more t[illegible]ible results in the months to come.

Philip M. Burgess
Study Director

Chapter 1

INTRODUCTION AND ESSENTIAL FINDINGS

A. Introduction to the Report

The Demand Task Group was established to gather and analyze data concerning the future demand for imported steam-quality coal[1] in Pacific Basin countries. This report summarizes the data and perspectives the Task Group has developed over the course of its investigation. The investigation has encompassed the following key efforts:

1. The June 1981 preparation of a questionnaire designed to elicit detailed information on the likely characteristics of Asian import coal demand over the next 10 to 20 years.
2. The sending of copies of this questionnaire to sponsors of the Western Coal Export Task Force coal export study in Japan, the Republic of China, and the Republic of Korea.
3. The sending of an initial fact-finding mission to the three Asian countries in July 1981.
4. Further face-to-face discussion of the import coal requirements of all three countries in conjunction with the Second Annual U.S.-Japan Coal Conference, held at Lake Tahoe, Nevada, in July 1981.
5. The September 1981 preparation of an initial report on the Asian import coal situation, based on an analysis of information provided (a) in August and September 1981 by the three Asian nations in response to the Task Group's questionnaire and (b) in July 1981 in the course of the face-to-face meetings in Asia and at Lake Tahoe.

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[1] We speak throughout this report principally of imported steam-quality coal--that is, of any coal not of anthracite grade and without the characteristics (for example, high free swelling index, high fluidity, or low volatility) that traditionally have been important for coke-making purposes.

6. The sending of a second fact-finding mission to the study-sponsoring Asian countries in September and October 1981 in order to verify information previously provided and to resolve several issues that arose in the preparation of the Task Group's initial report.

7. Preparation of this final report.

The following section of this chapter presents the essential findings of the Task Group's investigation, considering in turn the overall developments to be expected in the Pacific Basin market for steam-quality coal, the potential Pacific Basin market for U.S. western coal in particular, and the need both for continuing communication on technological and economic issues and for near-term action on the U.S. West Coast port situation. Chapter 2 presents the analysis on which these findings are based.

B. Essential Findings

1. Overall Market Developments

The following developments can be expected in the Pacific Basin market for imported steam-quality coal:

- Steam-quality coal imports will rise from the current (1981) level of 25 million tons to between 66 and 71 million tons in 1985 and to between 118 and 134 million tons in 1990.

  (While it is reasonable to question whether such magnitudes of imports are possible within the time frames indicated, there appear to be as many logical arguments for boosting the figures somewhat as for diminishing them somewhat. The principal factors at issue are dealt with in Chapter 2.)

- Power companies will emerge as the dominant coal importers, with their current market share of 24 percent rising to between 51 and 59 percent in 1985 and to between 65 and 80 percent in 1990.

- There will be a strong movement, particularly by power companies, to procure coal on a large-volume, long-term contract basis in order to secure a degree of predictability in fuel supply.

- Actions will be taken to diversify the Pacific Basin countries' sources of steam-quality coal imports in order to reduce the risk of severe long-term supply disruption and to reduce the market leverage that could otherwise accrue to those involved in coal exports from particular nations.

In the long run, the major suppliers for the Pacific Basin market will be Australia, the Peoples Republic of China, the United States, Canada, and the Republic of South Africa.

2. Potential Market for U.S. Western Coal

Few would have predicted in early 1980 that steam-quality coal exports from the U.S. West Coast would amount to over four million tons in 1981—a year, as it turned out, of Asian economic recession. It has been argued that work stoppages and vessel demurrage at Australian ports were the principal causes for U.S. western coal export activity. Will the current level of activity be sustained? Will it expand? The views of the Demand Task Group are summarized below.

- There will be relatively little steam-quality coal exported from the U.S. West Coast before the late 1980s unless a variety of conditions simultaneously occur. These conditions principally include: (a) a very substantial expansion of U.S. West Coast loading capacity; (b) the delay or disruption of a significant proportion of the supply of coals already committed from other sources; and (c) the availability of U.S. western coal under competitive terms.

- Considering the prospect for 1985 more specifically, the Task Group has learned (from study co-sponsors in Japan, Taiwan, and Korea) that the majority of Pacific Basin steam-quality coal imports have in some sense already been committed to non-U.S. sources. For cases where no specific data could be obtained regarding expected imports from U.S. western states, the Task Group has made what it considers to be conservatively realistic estimates of market shares. (The method of estimation is described in Chapter 2.)

  The bottom line: it is reasonable to expect that approximately 8 to 11 million tons of U.S. western steam-quality coal will be exported in 1985.

- Considering the prospect for 1990, the Task Group concludes that the picture then will brighten considerably, particularly since (by the Task Group's estimates) roughly two-thirds of the coal projected to be consumed in the Pacific Basin by that date has not yet been committed to supply arrangement.

Taking a variety of factors into account, the Task Group concludes that a realistic estimate for the year 1990 puts steam-quality coal exports from U.S. western states at 19 to 26 million tons.

- Although the Pacific Basin's power companies are expected to be the major importers of steam-quality coal by the mid to late 1980s, non-power-company purchases (particularly those of cement and steel companies) will be extremely important for western U.S. suppliers. In 1985, such non-power-company purchases could represent 53 to 67 percent of the total volume of coal exported from the western U.S. By 1990, such purchases could represent as much as 41 percent of the coal exported from the western U.S.

- Although there is a high level of interest in the possible use of subbituminous coal in Pacific Basin countries, the Task Group must conclude that appreciable volumes of this coal type from the U.S. western states are unlikely to be exported before the early 1990s.

Chapter 2

ANALYSIS

A. Magnitude and Distribution of Import Coal Requirements

The Demand Task Group has been presented with evidence pointing to a substantial boost in the import coal requirements of Pacific Basin countries.

In 1981, Japan, the Republic of China, the Republic of Korea, and other Pacific Basin countries (Hong Kong, the Philippines, Singapore, Thailand, and Malaysia) together will import approximately 25 million metric tons of steam-quality coal. By 1985 — according to the projections of Pacific Basin power companies, cement companies, steel companies, trading companies, and government authorities — the figure should increase to between 66 and 71 million tons. Then, by the year 1990, imports are expected to rise to between 118 and 134 million tons.

The largest consumer of imported steam-quality coal in 1981 in the above-mentioned countries will be the cement industry, using roughly 11 million tons, or 44 percent of total Pacific Basin imports. Power companies in 1981 will import approximately six million tons; the iron and steel industry, four million; and other industries, four million.

A major shift will soon occur not just in the magnitude of Pacific Basin import coal use but also in its distribution over industrial sectors. This change is illustrated in Figure 2.1. While cement company imports are projected to double over the period from 1981 through 1990 (comparing the Pacific Basin total for cement in column A, 1981, with the total for cement in column D, 1990), their share of total imports will fall from the present level of 44 percent to between 15 and 19 percent. Electric power company import requirements are expected to rise dramatically, both in absolute terms (from 6 million tons now to between 77 and 93 million in 1990) and in percentage-of-market terms (from 24 percent to between 58 and 79 percent). The import coal requirements of the iron, steel, and other industries (e.g., pulp and paper, chemical, and manufacturing) will rise significantly, but their importance in the overall coal-import demand picture will diminish.

Figure 2.1

Forecast of Pacific Rim Demand for Imported Steam-Quality Coal, to 1990 and Estimates of Market Share for U.S. Western Coal*

(In million metric tons — mmt)

	(A) 1981 Total Demand	(B) 1985 Total Demand	(C) 1985 Estimates of Western U.S. Market Share	(D) 1990 Total Demand	(E) 1990 Estimates of Western U.S. Market Share
JAPAN					
Electric Power[1]	3.8	14.5	0.2	40.0-46.0	7.0-10.0
Cement[2]	8.4	10.4	1.1	11.1	1.2
Iron and Steel[3]	4.0	5.0	1.0-2.5	6.0	1.2-3.0
Other[4]	1.7	4.1	0.8	5.9	0-1.2
Subtotal	17.9	34.0	3.1-4.6	63.0-69.0	9.4-15.4
CHINA, REPUBLIC OF					
Electric Power[5]	2.3	6.4-9.8	1.3	11.4-20.4	2.8
Cement[6]	0.5	2.1	0.4	3.8	0.8
Iron and Steel[7]	0	0	0	0	0
Other[8]	1.9	2.1	0.4	2.9	0.6
Subtotal	4.7	10.6-14.0	2.1	18.1-27.1	4.2
REA, REPUBLIC OF					
Electric Power[9]	0	7.1	1.8	10.8	2.7
Cement[10]	1.7	3.4-5.1	0.7-1.0	3.4-5.1	0.7-1.0
Iron and Steel[11]	0	0.5	0-0.5	1.0	0-0.5
Other[12]	0	2.1	0.4	3.4	0.8
Subtotal	1.7	13.1-14.8	2.9-3.7	18.6-20.3	4.2-5.0
TOTAL JOINT STUDY	**24.3**	**57.7-62.8**	**8.1-10.4**	**99.7-116.4**	**17.8-24.6**
OTHER PACIFIC RIM COUNTRIES**					
Electric Power[13]	0	6.3	0.3	15.3	0.8
Cement[13]	0.5	1.5	0.1	2.5	0.1
Iron and Steel[13]	0	0	0	0	0
Other[13]	0	0.1	0	0.2	0
Subtotal	0.5	7.9	0.4	18.0	0.9
PACIFIC RIM TOTALS					
Electric Power	6.1	34.3-37.7	3.6	77.5-92.5	13.3-16.3
Cement	11.1	17.4-19.1	2.3-2.6	20.8-22.5	2.8-3.1
Iron and Steel	4.0	5.5	1.0-3.0	7.0	1.2-3.5
Other	3.6	8.4	1.6	12.4	1.4-2.6
GRAND TOTAL	**24.8**	**65.6-70.7**	**8.5-10.8**	**117.7-134.4**	**18.7-25.5**

Note: For sources (numbered notes), see following pages.

*The estimates of U.S. western steam-quality coal prospects rest on two essential bases: the expectation that Asian consumers will find the prices of these coals to be in the competitive range and that, as a result, they will find it worthwhile to purchase these coals to fulfill a significant proportion of their total coal requirements. See source notes and text for fuller explanation of these estimates.

**Hong Kong, the Philippines, Singapore, Thailand, and Malaysia.

Sources for Figure 2.1

[1] Data for columns A, B, C, D, and E, were provided by the Japan Coal Development Company (JCD).

[2] Data for columns A, B, C, D, and E, were provided by the Japan Cement Association.

[3] The Japan Steel Industry provided data for columns A, B, and D. The Demand Task Group estimated the figures for columns C and E, assuming that U.S. western coal would account for 20 to 50 percent of total requirements.

[4] Data for columns A, B, and D were provided by the Japan Coal Development Company (JCD). The Demand Task Group estimated the figures for columns C and E. For columns C and E, the Task Group assumed that U.S. western coal would account for 0 to 20 percent of total requirements.

[5] Taiwan Power Company provided data for columns A, B, and D. The Demand Task Group estimated the figures for columns C and E by assuming that U.S. western coal would account for 20 to 25 percent of the lower end of the range of total coal requirements in 1985 and 1990, respectively.

[6] Taiwan Cement Industry provided data for columns A, B, and D. The Demand Task Group estimated the figures for columns C and E by assuming that 20 percent of total import requirements would be procured from U.S. western sources.

[7] China Steel Corporation.

[8] Taiwan Power Company provided data for columns A, B, and D. The Demand Group estimated the figures for columns C and E. For columns C and E, the Task Group estimated that U.S. western coal would account for 20 percent of total requirements.

[9] Korea Electric Company (KECO) provided data for columns A, B, and D. In estimating figures for columns C and E, the Demand Task Group assumed that 25 percent of total coal requirements would be purchased from U.S. western states.

[10] Korean Cement Industry provided data for column A and the lower ends of the ranges in column B. The upper ends of the ranges in these columns were estimated by the Demand Task Group in order to account for a possible "Olympics effect" on the capacity utilization of Korean cement factories. The Demand Task Group estimated the figures for column C, taking into account

the possibility that the 1988 Summer Olympics in Seoul would also have a positive effect on the post-1988 level of activity in the Korean cement industry. For columns C and E, the Demand Task Group assumed that Korean cement companies would purchase 20 percent of their total coal requirements from western U.S. suppliers.

[11] Pohang Iron and Steel Company (POSCO) provided data for columns A, B, and D. For columns C and E, the Demand Task Group assumed that if POSCO in fact purchases steam-quality coal in 1985 and 1990, it will tak 0 to 50 percent of its total requirements from western U.S. sources.

[12] The Korean Ministry of Energy and Resources and the Korean Maritime and Port Administration provided data for columns A, B, and D. The Demand Task Group estimated the figures for columns C and E. With regard to columns C and E, the Task Group assumed that "other industry" in Korea would purchase 20 percent of its total requirements from U.S. western states.

[13] The Demand Task Group developed estimates for all columns. The bases for estimates in columns A, B, and D were trading company information, various trade journals, and discussions with an official at Hong Kong Electric Company. With regard to columns C and E, the Demand Task Group assumed that U.S. western coals would account for five percent of total import coal requirements.

Figure 2.2

PACIFIC RIM UTLITY DEMAND:

Timing, Volume, Market Share
for JAPAN, KOREA, TAIWAN

Based on Plant by Plant Inventory

	1985	1990	1995	2000
Facilities Using Imported Steam Coal (Japan, Korean, Taiwan)	43	68	86	99
Megawatts Generated From Imported Steam Coal*	18,680	36,386	52,767	71,067
Utility Industry Demand for Imported Steam Coal	34.72	72.76	108.71	150.50
Imported Steam Coal Volume Exported to Utility Industry at:#				
40% Market Share	13.88#	29.10	43.48	60.20
30% Market Share	10.41	21.82	32.61	45.15
25% Market Share	8.68	18.19	27.17	37.62
20% Market Share	6.94	14.55	21.74	30.10
15% Market Share	5.20	10.91	16.30	22.57

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* All coal is designated in million ton volumes.

# As shown in this section, utility demand is one important key to expanded coal trade between the western U.S. and Pacific Rim nations. This is the case because utility demand represents long-term, stable, large-volume trade — the kind of commitment that is required to trigger the investments needed to deploy innovations in transportation systems to achieve cost-efficiencies in the coal chain that will help make U.S. coal more cost-competitive on a delivered BTU basis.

B. Power Companies' Role

The growing importance of power company coal purchases can be expected to have a major influence on the way coal business is conducted in the Pacific Basin. Put most succinctly, we can expect to see a mounting trend toward large-volume, long-term coal supply contracts and a diversification of coal sources in order to avoid the possibility of severe disruption to the energy-supply system.

Asian power companies, like their counterparts in the United States, will generally wish to purchase coal in very large volumes and to have long-term contracts cover a major proportion of their total import requirements. This approach will differ markedly from the general situation today in which relatively small volumes move under short-term arrangements.

The basic reason for this impending change in overall coal-procurement behavior is that power companies, by virtue of their utility obligation to serve their customers, are prudent to engage in long-range (10- to 20-year) planning to ensure their clientele of predictable and reliable supplies of power. Their position as utilities, moreover, allows them to do just this. First, they do not function directly in the same fiercely competitive and often unpredictable domestic and international markets that inhibit other types of firms (e.g., cement companies) from making long-term financial commitments. And, second, since the Pacific Basin power companies will generally wish to use their imported coal at new power stations—either baseloaded units or, where nuclear units are available, in a highly predictable load-following mode—they will enjoy reasonable certainty, despite the types of periodic economic downturns that inhibit other industries from entering into large-volume, long-term coal purchases, of being able to consume the coal on schedule.

As Pacific Basin countries contemplate coal-source diversification, they will want to make sure that their coal-supply sources are reliable and free from government price interference. Whereas Australian coal mines have been beset by labor problems resulting in serious supply interruptions, the majority of western U.S. mines have been free of labor difficulties. Given this labor situation, along with the Australian government's intervention in prices, a turn to the United States will be natural. But in this turn, it should be noted, all the Pacific Rim nations will want assurance from high U.S. government officials that there will be no government-imposed suspension of supplies and no price interference.

For the United States, then, the diversification of coal sources on the part of Pacific Basin power companies seeking large-volume, long-term contracts promises both substantial opportunities and important responsibilities. Before considering what such coal-source diversification for large-volume, long-term supplies may mean in concrete terms for the U.S. western states, it is important to describe, in turn, the environment in which power company coal-import forecasts are now being made, and the key role that non-power-company coal demand may play prior to the late 1980s.

C. The Forecasting Environment

In the 1960s and 1970s, the economic, overall energy consumption, and electricity consumption growth rates for Japan, the Republic of China, and the Republic of Korea were generally much greater than those experienced in the United States. Over the 1960-1979 period, the Japanese economy and its energy consumption grew at roughly twice the U.S. rates, while the Chinese and Korean rates were more than three times those of the U.S. Electricity consumption growth rates were impressive, particularly in the Republic of China, where the annual growth rate for the 20-year period exceeded 12 percent, and in Korea, where it amounted to 19 percent. Japan's electricity consumption growth rate of over 8 percent also far exceeded the U.S. rate.

The last two years (1980 and 1981) have seen a dramatic change in the economies and energy situations of these countries. Higher prices for oil and electricity, economic recession and attendant financial woes for major industrial sectors, and energy conservation programs have contributed to a situation in which no firm or government entity feels confident in projecting growth rates that parallel those of the 1960s and 1970s.

While no one with whom the Task Group spoke in the course of its investigation knows exactly what to expect for the 1980s, much less the 1990s, plans must be developed. Today's forecasting environment could probably be characterized as cautiously optimistic. The wide-spread feeling is that the Japanese, Taiwanese, and Korean economies will rebound fairly soon. Since each of these economies is very significantly dependent on export trade, the great hope is that the American and European economies will soon recover and, in so doing, speed the recovery of the Asian economies.

With regard to the electric power industries in these three countries, the cautious optimism about the future manifests itself in projections of electricity demand growth rates. Japan's power companies project a growth rate of 6.3 percent for the 1980-1985 period and a growth rate of 5.8 percent for the period from 1986 through 1990. Taiwan Power Company in its latest forecast (which is not its official forecast) sees a 6.7 percent annual growth for the 1981-1986 period and a 7.0 percent annual growth for the 1987-1991 period. (This compares with the official forecast of about a 9 percent annual growth over the period from 1980 through 1990.) Korea Electric Company's (KECO) projected annual growth rates are 10.9 percent for the 1982-1986 period and 10.3 percent for the 1987-1991 period. KECO states in its latest annual report that these figures may be revised.

One possible reason why KECO and the forecasting authorities in other Pacific Basin countries may wish at some point to revise their projections is that each of these nations is strongly interested in shifting away from energy-intensive industries. To the extent that such shifts take place, power company loads could be affected. And, since industrial-sector sales are the backbones for the power industries in these countries, potential national policies and programs aimed at effecting such a shift could be cause for downward revision.

If there are to be downward revisions to electricity demand growth rates, the question that naturally arises is: What effect would such revisions have on import coal requirements? In the case of Taiwan, however, where the most recent load forecast resulted in demand growth rates that were slightly more than two percentage points lower than the official 1980 forecast, the change was rather dramatic: the original forecast was for over 20 million tons of imports in 1990; the latest, for just over 11 million tons. The Task Group understands that Korea and Japan will continually reassess their forecasts for electric power demand and make any appropriate adjustments in their coal requirements.

This discussion has focused thus far on the possibility that forecasts of 1990 import coal requirements are too high. There is, of course, another side to the matter: the possibility that the import coal forecasts are too low. The principal reason for thinking the coal import forecasts too low would follow from a suspicion that the nuclear forecasts of these three countries may be too high. There is no doubt that, under the present circumstances, a leading priority of electricity-supply planners in these three countries is nuclear power development.

Japan's plan (see Figure 2.3) calls for an expansion in nuclear generating capacity from the 1980 level of 15,510 megawatts to a 1990 level of 50,920 megawatts, an increase of over 35,000 megawatts. (In the same time frame, Japan's coal-fired capacity is expected to expand by roughly 24,000 megawatts; its gas-fired capacity, by about 26,000 megawatts; its oil-fired capacity will decrease by approximately 3,000 megawatts; and its "other" capacity—principally hydroelectric—will increase by about 26,000 megawatts.) However, in the wake of the Three Mile Island incident, the Spring 1981 leak of irradiated water at a Japanese nuclear station, new-plant siting difficulties, and possible changes in load profiles, there is now growing discussion over the rate at which nuclear capacity can or should be introducted. In fact, while the plans call for over 35,000 megawatts of additional nuclear capacity in the next ten years, as of December 1981, official authorization and construction permits had been secured for only 10,110 megawatts of the total. For another 6,105 megawatts, official authorization had been received but construction permits remained to be secured. In other words, approximately 20,000 megawatts of nuclear capacity planned to come into service by the end of 1990 now remain in the conceptual stage.

Certainly the situation for Japan's planned coal-fired capacity is not much firmer. Of the 24,000 megawatts of additional capacity envisioned for 1990, less than half have been officially authorized. (Most of the authorized portion, as the Task Group understands the situation, is now in fact under construction.) In the case of coal-fired capacity, then, roughly 13,000 megawatts planned for 1990 remain in a conceptual stage.

(The Task Group is unable to assess the situation for other types of planned generating capacity—gas-fired, oil-fired, hydroelectric, etc.—since it lacks sufficient information about such facilities.)

There is a further point to be noted with regard to the status of planned nuclear and coal-fired plants. Simply because a plant has been officially authorized, has received its construction permits, and is under construction does not necessarily mean it will be in service by the end of 1990.

Japan's power companies are, of course, not the only ones whose capacity expansion plans are clouded by uncertainty. Taipower's plans for nuclear power call for an increase from 1,272 megawatts in 1980 to either 5,144 or 6,944 megawatts in 1990. And Korea's current plans for nuclear power call for a dramatic increase from 587 megawatts in 1980 to 8,917 megawatts in 1990. The Task Group thinks it entirely conceivable that, in these two countries and particularly in Korea, a change in circumstances could cause a scaling back of nuclear power development by 1990. For Korea, there may of course be delays in coal plant construction. The Task Group does not have sufficient data to predict what would occur in the competition between nuclear and coal. Nevertheless, the Task Group thinks it relevant to point out that, in both Taiwan and Korea, it is thought that coal-fired stations can be built in four to five years, whereas nuclear plants are seen as requiring significantly longer lead times. Given this response-time situation and the fact that load growth for the next decade is uncertain, greater flexibility rests with coal than with nuclear.

Future economic conditions and construction schedules for nuclear and coal-fired power plants are not the only uncertainties that now cloud the coal-import forecasting environments in Pacific Basin countries. Interestingly, the oil-supply situation is also a matter of intense debate, though not in the way one might expect. That is, one might expect energy planners in the Pacific Basin countries to entertain the possibility that oil prices in time might fall significantly as a consequence of the current "oil glut" continuing. In fact, there seems to be a general consensus in the Pacific Basin countries that oil prices will permanently remain a great deal higher than (for example) coal prices, and that oil supplies will always remain more subject to serious interruption.

Figure 2.3

FORECAST OF GENERATING CAPACITY BY TYPE
(Megawatts)

		1980					1985					1990				
		Coal	Nuclear	Oil Steam	LNG	Other*	Coal	Nuclear	Oil Steam	LNG	Other*	Coal	Nuclear	Oil Steam	LNG	Other*
Japan		5,260 (4.1%)	15,510 (12.0%)	59,480 (46.0%)	19,710 (15.2%)	25,400 (22.7%)	12,500 (7.1%)	27,880 (15.8%)	62,330 (35.3%)	32,390 (18.4%)	41,270 (23.4%)	29,560 (12.6%)	50,920 (21.7%)	56,330 (24.0%)	45,960 (19.6%)	51,790 (22.1%)
China, Republic of	July 1981 Forecast	980 (10.7%)	1,272 (13.9%)	5,527 (60.3%)	-	1,387 (15.1%)	3,605 (23.1%)	5,144 (32.9%)	4,634 (29.6%)	-	2,244 (14.4%)	4,550 (27.0%)	5,144 (30.5%)	4,376 (26.0%)	-	2,772 (16.5%)
	Official 1980 Forecast						4,115 (26.0%)	5,144 (35.5%)	4,328 (27.3%)	-	2,249 (14.2%)	7,850 (33.5%)	6,944 (29.6%)	4,288 (18.3%)	-	4,372 (18.6%)
Korea, Republic of		725 (7.7%)	587 (6.3%)	5,787 (61.6%)	-	2,292 (24.4%)	4,445 (28.4%)	3,317 (21.2%)	3,843 (24.5%)	700 (4.5%)	3,347 (21.4%)	5,945 (26.6%)	8,917 (39.9%)	2,693 (12.1%)	700 (3.1%)	4,070 (18.2%)

Sources: Japan: Japan Federation of Electric Power Companies, September 28, 1981 (includes capacity of firms not affiliated with the federation). Rebpulic of China: Taiwan Power Company. Republic of Korea: Korea Electric Company.

*Includes ordinary hydroelectric, pumped storage, geothermal, internal combustion, LPG, and tidal.

The actual uncertainties concerning oil, then, are twofold. First, due in part to the recent economic downturns in the Pacific Basin countries, to the conversion from oil to coal by the cement and steel companies in these countries, and to contractual commitments to continue taking high-priced oil deliveries from producing nations, many local refiners and distributors in these countries are faced with severe financial difficulties. This situation has become of national concern, and efforts have been made to have power companies, in particular, actually use more oil for fuel than they would like to. We presume that this situation in some cases has delayed plans to use imported coal. It is unclear to the Task Group how long the present situation will last.

D. Non-Power-Company Import Coal Demand

Today, non-power-company steam coal purchases represent three-quarters of the Pacific Basin import market. While it is likely that these purchases will fall in the future in terms of market share, they will be extremely important nevertheless, particulary for western U.S. suppliers. If the Task Group's assessment of the Pacific Basin market for western U.S. coals is correct, such purchases will be crucial, for they will represent 58 to 67 percent of the steam coal exported from the western states in 1985 and as much as 41 percent of the 1990 steam coal exports.

There are three major types of non-power-company consumers: cement companies, steel companies, and other types of industries (such as pulp and paper and chemical) which are energy intensive.

As a group, cement companies at present consume roughly 17 to 19 million tons of imported coal. This level of coal consumption could rise significantly in the future, since factory utilization today generally stands at only about 60 percent of capacity, due to lower overall product demand in the recession-affected domestic and export markets. While there is a substantial uncertainty as to future import coal requirements by the Pacific Basin's cement companies, it would appear that, in at least one country, Korea, there is great potential for expanded use. Korea will be the host of the 1988 Summer Olympics; and, by one estimate, the amount of cement needed for that project is equal to the total current installed capacity of the Korean cement industry. In other words, capacity utilization at Korean cement plants should improve markedly once the Olympics-related projects commence construction. It is also conceivable that, if Korean cement marketing focuses on domestic consumers, cement plants in other Pacific Basin nations will also be utilized more fully in order to satisfy the export demand that cannot be met by the remaining Korean capacity. In short, taking into account the potential "Olympics effect" and the prospect for an improvement in domestic economies and in the economies of nations to which the Pacific Basin countries' cement can be exported, the Task Group thinks the cement factories will represent a strong market for imported coal.

Steel companies, particularly those in Japan, comprise a very promising market for steam-quality coal. In 1981, several Japanese companies will import such coal for briquetting or for direct blending with traditional coking coals. About half of the steam-quality coal imported this year for these uses will have come from Utah, Colorado, or New Mexico.

In addition, some of the coals imported from these sources have properties (e.g., a free swelling index greater than three) that would permit them to be termed "semi-coking" or even "coking" coals. (It is generally thought that such coals in the western U.S. are in extremely limited supply; hence, the Task Group has ignored the potential for their export. Nevertheless, it is conceivable that perhaps one to three million tons of such coals could be exported each year in the mid- to late-1980s.)

The Task Group has been informed that the total Pacific Basin steel-company demand for steam-quality coal could reach over five million tons in 1985 and about seven million tons in 1990. The Task Group has assumed that as much as half that demand could be met from western U.S. sources.

However, very significant uncertainties surround the estimates of total demand and the western U.S. market share. In this regard, the Task Group understands that: (1) Japanese steel companies have had mixed experience with steam-quality coals, particularly those mined in the western U.S.; and (2) some steel companies feel that the economics of briquetting steam coals are marginal at best, since these coals are now priced only about $10 per ton cheaper than acceptable-grade coking coals. However, the Task Group also understands that much experimentation is being done with new technologies (pulverized coal injection, coal-oil mixtures, coal-tar mixtures, formed coke, and solvent coal refining) to use steam-quality coals in different applications. If experiments prove successful and economics point to the feasibility of the new technologies, then the demand for steam-quality coals may be significantly higher than now thought likely.

Regarding the potential demand for imported steam coal by other non-power-company consumers in the Pacific Basin, it appears that the economic recession in general and the poor financial health of certain types of industries (notably pulp and paper) will delay a switch from oil to coal use. In many cases, plans to build new coal-fired boilers have had to be shelved and, in any event, energy requirements have been reduced. In the long run, however—once they recover from the recession, and assuming that the previously-mentioned potential for national policies to reduce the importance of energy-intensive industries does not negatively affect their economic viability—such industries may become very significant as consumers of imported steam coal.

E. Coal-Source Diversification and Implications for the Western U.S.

The Demand Task Group understands that coal-source diversification is favored in Japan, the Republic of China, and the Republic of Korea. Moreover, it considers it logical that diversification policies will be formulated in other Pacific Basin coal-importing nations as well. To the best of the Task Group's knowledge, however, no Pacific Basin country has decided precisely how much coal it can or should purchase from each source in any particular time frame. Such decisions turn largely on:

1. Perceptions of the coal availability, inland transportation situation, and loadport capacity associated with each potential coal-exporting area over time.
2. Perceptions of the prices that will obtain over time for each export area's coal, inland transport, and ocean transport.
3. Perceptions of the stability and reliability over time of labor and government entities in each coal-exporting area.
4. Perceptions of the actual volumes of import coal that will be required over time.

Of course, the supply and demand situations that coal importers face are dynamic, and perceptions will change. Deciding how much coal to purchase from each source in what time frame is extremely difficult; and actual purchases from particular sources could well turn out to be significantly higher or lower than today would be thought prudent or likely.

Despite the uncertainty inherent in any coal-source-diversification policy, the Task Group has considered it useful to ask coal consumers, government authorities, banking officials, trading companies, and other knowledgeable observers of the coal-import situation what they believe the diversification policies will mean for the export potential of various sources.

Generally speaking, the current view is that Australian steam coal will command a dominant market position in the Pacific Basin throughout the 1980s. Estimates generally put the Australian market share at 50 to 60 percent for 1985 and at 40 to 50 percent for 1990. Coals producible in the Peoples Republic of China and in the western U.S. are expected to capture rising shares of the total Pacific Basin market for imported steam coal: China and the western U.S. each could capture 10 to 15 percent of the market by 1985 and 15 to 20 percent by 1990. Coals producible in Canada and the Republic of South Africa are expected to fill most of the remaining import requirements, with coals from Colombia and the Soviet Union taking very small market shares through 1990.

The foregoing estimates of market shares take the coal requirements of the entire Pacific Basin into account. Significant variation exists regarding the coal sources to which particular countries will look and the extent to which commitments to these sources have already been made.

1. Japan

In Japan, all of the above-mentioned sources would be considered. In terms of expected sources, the Task Group notes that in a recent speech in Sydney, a Japanese representative estimated that Japan would consume 19.1 million tons of Australian steam coal in 1985 and 27.3 million tons in 1990.[1] These figures covered steam coal imports for all Japanese consumers except iron and steel companies. If iron and steel company requirements of five million tons in 1985 and six million tons in 1990 were included, Australian steam coal imports would represent 56 percent of Japan's 1985 demand and 40 to 43 percent of its 1990 demand. As for the Peoples Republic of China, the Task Group understands that Japan hopes to import five million tons of Chinese steam coal in 1985 and perhaps ten million tons in 1990. If these levels are achieved, they would represent roughly 15 percent of Japan's 1985 requirements and between 14 and 16 percent of its 1990 requirements.

Considering the prospects for the western U.S., the Task Group has been informed that Japanese power companies and cement companies together expect to look to the western U.S for 1.3 million tons in 1985 and for 8.2 to 11.2 million tons in 1990. The Task Group has not been provided with specific projections for either steel companies or other types of industries in Japan. However, if we assume that western U.S. steam coal will supply between 20 and 50 percent of the steel company requirements and between 0 and 20 percent of the other industries' requirements, then we can expect western U.S. exports to Japan to total between 2.3 and 4.6 million tons in 1985 and between 9.4 and 15.4 million tons in 1990. At these export levels, the western U.S. would supply 7 to 14 percent of Japan's 1985 requirements and 14 to 24 percent of its 1990 requirements.

Summarizing the situation at this juncture, we find that sources in Australia, the Peoples Republic of China, and the western U.S. together could represent 78 to 85 percent of Japanese steam coal imports in 1985 and 68 to 83 percent of such imports in 1990. Canadian and South African sources can be expected to capture the lion's share of the remainder.

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[1] As reported in Coal Week International (McGraw-Hill), 4 November 1981.

2. Republic of China

In the Republic of China, principal consideration is being given to four sources of steam coal: Canada, Australia, the Republic of South Africa, and the U.S. (western and eastern states). The major consumer in the Republic of China is Taipower, whose officials have expressed the desire to purchase coal from these four sources in roughly equal amounts. Taipower's import requirements will range between 6.4 and 9.8 million tons in 1985 and between 11.4 and 20.4 million tons in 1990. (The import coal requirements of Taiwan's cement companies and other industries are expected to amount to 4.2 million tons in 1985 and 6.7 million tons in 1990.) Considering the fact that the lower ends of the ranges for Taipower reflect the firm's latest forecasts, the Task Group is inclined to base its assessment on those figures. At such lower levels of imports, it appears that all the coal needed by Taipower in 1985 (6.4 million tons) has already been purchased. In fact, according to the figures provided in a presentation by Taipower officals in May 1981,[2] commitments for 6.97 million tons for 1985 have already been made, with 23 percent of the total to be imported from Canada; 19 percent from Australia; 14 percent from South Africa; and 44 percent from the U.S. The Task Group assumes that roughly 38 percent of the total for the U.S. as a whole will be produced in the western states. As for the 1985 requirements of Taiwan's cement companies and other industries, the Task Group has assumed that roughly 20 percent will be imported from the western U.S.

Considering Taipower's 1990 import requirements at the lower end of the 11.4-20.4 range, the Task Group finds (again relying on the May 1981 presentation by Taipower officials) that 7.3 million tons of the required 11.4 million have already been arranged. Of the 7.3 million tons, 48 percent will be imported from Canada, 14 percent from Australia, 7 percent from South Africa, and 31 percent from the U.S. The present U.S. commitment amounts to 2.3 million tons in 1990. The Task Group assumes that, by 1990, Taipower will take 25 percent of its total requirements from the western U.S. Hence, the assumed figure for that year is 2.8 million tons from the U.S. West. The Task Group further assumes that other coal importers in the Republic of China will take 20 percent of their 1990 requirements from U.S. western states.

3. Republic of Korea

In the Republic of Korea, the major sources of steam coal imports are expected to be Australia, Canada, the U.S., and the Peoples Republic of China. The Task Group was not provided with specific indications of the Korean strategy for coal-source diversification. Nevertheless, the Task Group thinks it reasonable to assume that Korean firms will consider using U.S. western sources to meet 25 percent of the import requirements of the large facilities that can accommodate large vessels (e.g., Korea's new power stations) and 20 percent of the import requirements of the smaller facilities that cannot take coal in large vessels (e.g., cement factories and other industrial facilities). So far, Korean firms have made major long-term commitments (commitments running at least ten years) for steam coal supplies only with Australian and Canadian producers. Korean firms are committed to taking roughly 500,000 tons from U.S. western sources in 1985. No firm commitments with U.S. suppliers exist with regard to 1990 import requirements. Nevertheless, the Task Group can foresee a major commitment to this source being made in the near future. In fact, with sufficient port capacity on the West Coast and reasonable F.O.B. port prices, Korean firms could take three to four million tons from the western U.S. by 1985 and four to five million by 1990.

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[2] Presentation by P.S. Pan and W. F. Cheng, "Steam Coal Demand and its Supply in Taiwan, Republic of China", May 1981.

4. Other Pacific Basin Countries

For other Pacific Basin countries (Hong Kong, the Philippines, Singapore, Thailand, and Malaysia), the principal sources of future steam coal supplies will be Australia, the Peoples Republic of China, and South Africa. Australian coal should be particularly attractive to most of these countries, both because it will have a very significant ocean-freight advantage over other potential sources and because the Australians seem very willing to help the firms in these countries overcome technical barriers to coal use. Hong Kong's power companies, which are constructing several new coal-fired stations, will take substantial amounts of coal from Australia, somewhat lesser amounts from South Africa, and large volumes also from the Peoples Republic of China. Despite the formidable coal-supply competition for the markets in these other Pacific Basin countries, the Task Group can conceive of a role for the western U.S. We have assumed that western U.S. suppliers will be able to capture five percent of these countries' market requirements in 1985 and 1990.

5. Summary Estimates

In summary, taking into account the import coal requirements and source-diversification policies of all the Pacific Basin countries, the Demand Task Group estimates that U.S. western producers as a whole can realistically expect to supply the Pacific Basin nations with 8.5 to 10.8 million tons of coal in 1985 and with 18.7 to 25.5 million tons in 1990. Actual tonnages could turn out to be somewhat higher or somewhat lower, depending on the importing nations' economic health, on their decisions as to whether to build coal or nuclear power stations, on the physical availability of coals from the various potential export sources, on the prices at which these coals are offered, and on the relative stability and reliability of the various coal sources.

Appendix A

WESTERN COAL EXPORT TASK FORCE (CETF) - PACIFIC BASIN STEAM COAL EXPORT STUDY

A. Western CETF Sponsor - Participants

1. Coal Producers

AMAX Coal Company
105 W. Meridian Street
Indianapolis, IN 46225
Peter M. Garson
Vice President - Sales
(317) 266-2815

AMOCO Minerals Company
Cyprus Coal Company
6900 S. Yosemite Street., Suite 150
Englewood, CO 80112
D. P. Bellum
President
(303) 740-5131

ARCO Coal Company
555 Seventeenth Street
Post Office Box 5300
Denver, CO 80217
R. G. Daniel
Senior Vice President
Resource Acquisition and Marketing
(303) 576-4118

Coastal States Energy Company
Nine Greenway Plaza
Houston, TX 77046
Leo C. Smith
Senior Vice President
Coal and Chemicals
(713) 877-6400

Colorado Westmoreland
9034 E. Easter Place, Suite 205
Englewood, CO 80112
Daniel J. Snyder
President
(303) 799-0902

Diamond Shamrock Corporation
Falcon Coal Company
1200 First Security Plaza
Lexington, KY 40507
Thomas A. Plato
Executive Vice President
International
(606) 231-5370

Getty Oil Company
3810 Wilshire Boulevard
Los Angeles, CA 90010
H. E. Wendt
Vice President and General Manager
(213) 739-2485

Mobil Oil Corporation
Mining and Coal Division
Post Office Box 17772
Denver, CO 80217
Palmer C. Fuselier
General Manager - U.S.
(303) 628-6380

NERCO, Inc.
111 S.W. Columbia, Suite 800
Portland, OR 97201
Gerard Drummond
President
(503) 241-6611

Northern Coal Company
740 S. Colorado Boulevard, Suite 200
Post Office Box 17583 Terminal Annex
Denver, CO 80217
Donald Spangenberg, Jr.
Vice President - Marketing
(303) 753-8600

Peabody Coal Company
301 N. Memorial Drive
St. Louis, MO 63102
John P. Smith
Vice President - Marketing
(314) 342-3478

Peter Kiewit & Sons', Inc.
1000 Kiewit Plaza
Omaha, NE 68131
Donald Bishop
Vice President
(402) 342-2052

Rocky Mountain Energy Company
10 Longs Peak Drive
Post Office Box 2000
Broomfield, CO 80020
James C. Wilson
President
(303) 469-8841

Santa Fe Mining Company
Post Office Box 3588
Albuquerque, NM 87190
R. T. Zitting
President
(505) 262-2211

Shell Oil Company
Pecten Coal International, Inc.
Woodcreek Complex
Post Office Box 2906
Houston, TX 77001
Charles T. Evans
Vice President
Marketing - Far East
(713) 870-3135

Sprague Coal International
2500 Fidelity Building
Philadelphia, PA 19109
Alan M. Irving
Director of
International Operations
(215) 545-2500

Utah International, Inc.
550 California Street
San Francisco, CA 94104
George W. Tarleton
Vice President
Minerals Products Marketing
(415) 981-1515 ext. 414

Valley Camp Coal
Box 989
Oil City, PA 16301
Roger Markle
President
(814) 676-0684

Westmoreland Resources, Inc.
2705 Montana Avenue
Billings, MT 59101
Joseph Presley
President
(406) 248-7803

W. R. Grace & Company
3333 Quebec St., Suite 8800
Denver, CO 80207
Ira McKeever
President
Western Mining Operations

Charles W. Margolf
Director
Western Coal Operations
(303) 399-0779

2. Railroads

The Atchison, Topeka and
Santa Fe Railway Company
224 S. Michigan Avenue
Chicago, IL 60604
Lawrence Cena
President
(312) 427-4900

Burlington Northern, Inc.
176 E. Fifth Street
St. Paul, MN 55101
Richard M. Bressler
President
(612) 298-2121

The Denver & Rio Grande
Western Railroad Company
Post Office Box 5482
Denver, CO 80217
W. J. Holtman
President
(303) 629-5533

Southern Pacific
Transportation Company
Southern Pacific Building
One Market Plaza
San Francisco, CA 94105
D. K. McNear
President
(415) 362-1212

Union Pacific Railroad Company
1416 Dodge Street
Omaha, NE 68179
J. C. Kennefick
President
(402) 281-5822

Western Pacific Railroad Company
526 Mission Street
San Francisco, CA 94105
Robert G. (Mike) Flannery
President and
Chief Executive Officer
(415) 982-2100

3. Ports and Port Developers

Kaiser Cement Corporation
300 Lakeside Drive
Oakland, CA 94612
Walter E. Ousterman, Jr.
Chairman, President and
Chief Executive Officer
(415) 271-5107

Lone Star Industries, Inc.
One Greenwich Plaza
Greenwich, CT 06830
Herbert B. Greene
Senior Vice President
(203) 661-3100

Pacific Resources, Inc.
Post Office Box 3379
Honolulu, HI 96842
Rogert Ulveling
Vice President,
Government Affairs
(808) 547-3420

Port of Bellingham
Post Office Box 1737
625 Cornwall Avenue
Bellingham, WA 98225
Thomas Glenn
General Manager
(206) 676-2500

Port of Grays Harbor
Post Office Box 660
Aberdeen, WA 98520
H.E. Soike
General Manager
(206) 533-9528

Port of Kalama
Post Office Box 7
Kalama, WA 98625
John Fratt
Manager
(206) 673-2325

Port of Long Beach
Post Office Box 570
Long Beach, CA 90801
James H. McJunkin
General Manager
(213) 437-0041

Port of Los Angeles
Post Office Box 151
San Pedro, CA 90733
Dr. E. Perry
Executive Director
(213) 519-3400

Port of Portland
Post Office Box 3529
700 N.E. Mulnomah
Portland, OR 97208
Lloyd Anderson
Executive Director
(503) 231-5000

Port of Redwood City
475 Harbor Boulevard
Redwood City, CA 94063
Fred J. DiPietro
Port Manager
(415) 365-1613

Port of Sacramento
Word Trade Center
West Sacramento, CA 95961
Melvin Shore
Executive Director
(916) 373-3420

Port of Stockton
Post Office Box 2089
Stockton, CA 94201
Alexander Krygsman
Port Director
(209) 946-0246

Port of Vancouver
Post Office Box 1180
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Appendix B

WESTERN COAL EXPORT TASK FORCE

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Appendix C

WESTERN COAL EXPORT TASK FORCE

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Appendix D

CHARTER OF THE WESTERN COAL EXPORT TASK FORCE-PACIFIC BASIN STEAM COAL EXPORT STUDY

A. CHARGE

The Western Coal Export Task Force-Pacific Basin Steam Coal Export Study is hereby initiated by the Western Coal Export Task Force (CETF), the Japan Coal Development Company (JCD), the Taiwan Power Company (Taipower), and the Korea Electric Company (KECO). Its purpose is to consolidate, verify, and synthesize information for business, government, and others to use, if they choose, in making decisions that will trigger a long-term, stable steam coal trade between the western U.S. and the Pacific Basin. The preliminary report of the joint study will be issued to sponsors by mid-September 1981. Based on review of findings and conclusions, sponsors will determine the necessity and timing of further investigation. The study will conclude no later than December 31, 1981.

B. BACKGROUND

The Western Coal Export Task Force (CETF) was formed by more than 70 coal producers, railroad executives, and port managers and developers in October 1981, under the auspices of the Western Governors' Policy Office (WESTPO). Its purpose is to help solve problems impeding long-term, stable coal trade between the western U.S. and the Pacific Basin.

U.S. industry stands ready to invest hundreds of millions of dollars to serve the Pacific Basin market for steam coal — in expanded mine capacity and transportation infrastructure development — if the economics of such investments are reasonable. Moreover, steam coal trade will (1) improve our economic ties, (2) improve our balance of payments, (3) enhance the concept of free trade by providing abundant U.S. energy reserves to allies who have a need for those resources, and (4) reduce global dependence and pressures on unstable oil supplies.

However, investment decisions are needed today for expanded steam coal trade five years from now. U.S. export interests need to have information on conditions and plans in the Pacific Basin so that the expansion of U.S. production and infrastructure can be integrated with the timing of demand and off-loading facility construction in Pacific Basin countries. Pacific Basin buyers need objective, validated information about the U.S. coal supply and transportation systems so that investments and long-term contracts can be consummated. Therefore, the joint study is undertaken as a coordinated approach to examining and resolving the issues on both sides related to large-volume, long-term coal export from the western U.S. to the Pacific Basin.

The Western CETF-Pacific Basin joint study results from cooperative efforts initiated in 1979 between the public and private sectors in the U.S. and between Pacific Basin buyers and sellers. The western U.S. coal export industry, western U.S. exporters, western governors, and the federal government all support the study. On the buying side, the utility, cement, and steel industries in Japan, the Republic of Korea (RoK), and the Republic of China (RoC), are participating with U.S. exporters under bilateral agreements between a lead organization in each country and the Western CETF.

The study will analyze a range of issues in steam coal export, considering both buyers and sellers, including the following:

- Pacific Basin market for western U.S. steam coal: quantity, type and quality specifications, timing of need, committed and uncommitted volumes, and technological changes influencing buying decisions.
- Western U.S. steam coal supply: quantity, type and quality specifications, location and timing of availability, and buyer interest in equity participation in mines.
- Overland transportation: mine mouth links, system capacity and commodities mix, physical and environmental constraints, potential for expansion and upgrading, lead times for expansion, published tariffs, and coal slurry technology.
- Ports and marine transportation: world bulk vessel fleet (present and planned), capacity and timing of development for exporting and receiving ports, generic capital and operating costs, lead times for port expansion, announced plans to alleviate port congestion, and opportunities for foreign investment.
- Institutional, legal, and regulatory factors: antitrust regulations, international trade agreements, coal leasing laws, tax structures, and legislative initiatives.

The study is fact-finding only. It will not recommend a specific mine, railroad route, or port site. It will verify, consolidate, and synthesize information for business to use, if it chooses, in making business decisions. At the same time, during the study, bilateral business negotiations are expected to continue as in the past.

The study will be objective, under the auspices of the Western Governors' Policy Office (WESTPO). No single business interest or political preference will be highlighted or allowed to unduly influence the outcome.

C. APPROACH

The study is sponsored and guided by coal buyers and sellers, and by industry and government. The joint study process includes a number of organizational elements designed to ensure an appropriate balance between policy and technical considerations. These include (1) a Policy Liaison Group, (2) a Steering Committee, and (3) Industry Task Groups.

The Policy Liaison Group, chaired by Utah Governor Scott M. Matheson, Western CETF Chairman, and including western U.S. industry representatives, will communicate and collaborate directly with the working group in each cosponsoring country to: (1) oversee the study process, (2) assess and suggest policies and directions for study inquiry, (3) monitor the industry technical study process, and (4) accept and approve all official reports of the study process.

The Gubernatorial Steering Committee, chaired by Utah Governor Scott M. Matheson and composed of the governors of ten other participating states —including Governors Babbitt (AZ), Brown (CA), Lamm (CO), Evans (ID), Schwinden (MT), List (NV), King (NM), Atiyeh (OR), Spellman (WA), and Herschler (WY). The Gubernatorial Steering Committee oversees the study process from a state perspective — i.e., performs the functions of the Policy Liaison Group on behalf of state government. The work of the governors on the Gubernatorial Steering Committee is assisted by governors' representatives on a Staff Working Group (SWG).

The Steering Committee, composed of representatives of the five industry task groups, representatives of state government, and representatives of the Policy Liaison Group will: (1) assure timely completion of task group products, (2) coordinate, synthesize, and interpret individual task group reports, and (3) advise the Western CETF chairman on operational matters of the Task Groups, including resource allocation to special studies.

Industry Task Groups will produce a report on key issues in each of the five study areas: (1) Pacific Basin demand for steam coal, (2) western U.S. coal supply, (3) overland transportation, (4) ports and marine transportation, and (5) institutional and regulatory factors.

Members of the Industry Task Groups will be professional and policymaking representatives of the industries sponsoring the study. Each task group will include a representative of state government, to help ensure that subsequent business decisions will be more fully and broadly understood by government and to facilitate government assistance in overcoming some of the constraints to a substantial coal trade. Each task group will be chaired by an industry sponsor/member and assisted by a technical associate, who will help assemble, analyze, integrate, and report information.

The work of task groups will be reviewed by an attorney to ensure that agendas, tasks, and decisions are consistent with federal, state, and local statutes and regulations appropriate to such gatherings.

D. MEMBERSHIP

The Western Coal Export Task Force (CETF) will engage in three separate but parallel bilateral cosponsorship agreements with each of the three major steam coal-using countries in the Pacific Basin (Japan, South Korea, and the Republic of China). All major industries in the coal chain are participating: coal producers, railroads, and ports on the U.S. side and utilities, cement, and steel companies on the Pacific Basin side.

Membership in the Western CETF includes (1) coal export industries — coal producers, railroads, and port developers, (2) federal agencies (ex officio), including the Department of Energy (DOE) and Army Corps of Engineers, and (3) western governors who choose to participate on the gubernatorial steering committee, including the WESTPO governors and the governors of Washington, Oregon, and California.

Lead Pacific Basin cosponsoring organizations are the Japan Coal Development Company (JCD), Taiwan Power Company, and the Korea Electric Company (KECO). In each country, the lead organization has the support and participation of the cement and steel industries and the central government.

E. FINANCING

The Western CETF will cosponsor the study under separate but parallel bilateral agreements with the Japan Coal Development Company (JCD), Taiwan Power Company, and the Korea Electric Company (KECO). The study is funded at $400,000, with each of the four cosponsors contributing equal shares. The U.S. share is financed completely by industry subscriptions. Study funds are administered by WESTPO, with management oversight by the Policy Liaison Group.

Appendix E

CHRONOLOGY OF EVENTS RELATED TO THE WESTERN COAL EXPORT TASK FORCE DEMAND TASK GROUP

October 10, 1980	Governor Scott M. Matheson (Utah), Chairman of the International Market Development Steering Committee of the Western Governors' Policy Office (WESTPO), hosts a coal export briefing. More than 70 coal producers, transportation executives, and port executives and developers attend. Participants agree to form the Western Coal Export Task Force (CETF) under the auspices of WESTPO, to foster the expansion of steam coal exports from the western U.S. to the Pacific Basin.
February 20, 1981	At a meeting of the Western CETF, participants endorse the concept of a study of western U.S. steam coal exports to the Pacific Basin, to be jointly sponsored by Pacific Basin buyers and western U.S. exporters. They also decide that industry task groups should carry out the research and analysis tasks as much as possible, minimizing the use of third parties.
April 11-22, 1981	Governor Matheson dispatches a seven-member delegation to the Pacific Basin to determine coal-user interest in participating in a study of western U.S. steam coal trade. The mission includes representatives of coal producers, railroads, and ports.
April 17, 1981	During the Western CETF mission to the Pacific Basin, Kazuhiro Kotani, Director of the Japan Coal Development Company (JCD), and Philip M. Burgess, WESTPO Executive Director representing the Western CETF, sign a memorandum of understanding to cosponsor a joint study of western U.S. coal exports to the Pacific Basin. Similar agreements are subsequently signed with David S. L. Chu, President of Taiwan Power Company, and Nack Chung Sung, Executive Vice President of the Korea Electric Company (KECO).

May 16, 1981	WESTPO governors, in a meeting chaired by WESTPO chairman Ed Herschler (Wyoming) at the Governor's mansion in Denver, Colorado, approve the proposals for a joint study of coal export issues with Japan, the Republic of China, and South Korea and endorse the general approach of the Western Coal Export Task Force.
June 1, 1981	Following escrow deposits of agreed-upon contributions by joint study sponsors, the joint study is formally initiated.
June 9-10, 1981	The organization meeting of Industry Task Group chairmen and technical associates is held in Denver, Colorado, to review the study scope, approach, ground rules, and schedules.
June 22, 1981	The Demand Task Group chaired by C. R. Moore, Marketing Manager of the Minerals Division, Getty Oil Company, meets to outline its scope of study and approach.
July 4-10, 1981	At the request of Western CETF Demand Task Group Chairman C. R. Moore, Marketing Manager of the Minerals Division, Getty Oil Company, Western CETF Chairman Scott M. Matheson dispatches a mission to the Pacific Basin. Western CETF representatives meet with study cosponsors in Japan, South Korea, and the Republic of China and specialists in coal use and port infrastructure development in those countries.
July 15, 1981	The Western Coal Export Task Force (CETF) hosts a Study Review Meeting in Lake Tahoe, Nevada. Delegations from JCD, Taiwan Power Company, and KECO present to CETF members information on their demand for steam coal and receiving port facilities.
July 26, 1981	Philip M. Burgess, Western CETF Study Director, meets to discuss the study with representatives of national environmental organizations in Washington, DC. The Organization of Resource Councils, Environmental Policy Center, Sierra Club, and Friends of the Earth are represented.
July 28, 1981	The first mid-course policy review of the study findings is held in Denver, Colorado. In attendance are the Western CETF Steering Committee and members of the Staff Working Group.

September 11, 1981	Western CETF Steering Committee report review meeting at WESTPO offices.
September 28 - October 8, 1981	Governor Scott M. Matheson, Western CETF Chairman, dispatches a mission to the Pacific Basin to verify information on steam coal demand and receiving ports and to give a preliminary report on study findings.
October 10-18, 1981	Governor Scott M. Matheson, Western CETF Chairman, dispatches a policy mission to the Pacific Basin, led by Philip M. Burgess, Study Director. The delegation presents findings of the study and receives review and comment from Pacific Basin cosponsors.
October 19, 1981	The Staff Working Group meets in Denver, Colorado, to formally review study reports and discuss follow-up actions.
October 20, 1981	The Policy Liaison Group meets in Denver, Colorado, to formally review and approve study technical reports and discuss dissemination strategies.
November 17, 1981	Governor Scott M. Matheson and Philip M. Burgess meet with national environmental leaders in Washington, DC to receive their comments on the study reports.
November 20, 1981	The Policy Liaison Group meets in Denver, Colorado, to review the draft of the summary report.
December 10-11, 1981	Governor Scott M. Matheson convenes a final meeting of the U.S. and Pacific Basin study cosponsors in Honolulu, Hawaii, to formally release the study reports and to discuss implications and conclusions. Delegations from each of the Pacific Basin Working Groups, as well as Western CETF members, participate.

Appendix F

PACIFIC RIM UTILITY DEMAND FOR IMPORTED STEAM COAL

1981-1985

	1981	1982-83	1984-85	Cumulative Totals 1981-85
JAPAN				
Facilities	4	8	14	26
Megawatts	1,406	2,728	6,821	10,955
Coal Use*	3.07	4.43	10.24	17.74
KOREA				
Facilities	0	3	4	7
Megawatts	0	1,620	2,425	4,045
Coal Use	0	3.90	3.60	7.50
TAIWAN				
Facilities	6	1	3	10
Megawatts	980	1,000	1,700	3,680
Coal Use	2.59	2.57	4.32	9.48
TOTAL: Facilities	10	12	21	43
TOTAL: Megawatts	2,386	5,348	10,946	18,680
TOTAL: Coal Use	5.66	10.90	18.16	34.72

	1981	1982-83	1984-85
CUMULATIVE COAL USE	5.66	16.56	34.72
Illustrative market share volumes of cumulative total of coal demand.			
40% of market	2.26	6.62	13.88
30% of market	1.69	4.96	10.41
25% of market	1.41	4.14	8.68
20% of market	1.13	3.31	6.94
15% of market	.84	2.48	5.20

Note: This data was compiled from the information contained in Appendices G thru J.

*In Million Metric Tons

PACIFIC RIM UTILITY DEMAND FOR IMPORTED STEAM COAL

1986-1989

	1986-87	1988-89	Cumulative Totals 1981-89
JAPAN			
Facilities	9	11	46
Megawatts	4,606	8,800	24,361
Coal Use	9.73	18.48	45.95
KOREA			
Facilities	1	1	9
Megawatts	500	500	5,045
Coal Use	1.20	1.20	9.90
TAIWAN			
Facilities	1	2	13
Megawatts	1,100	2,200	6,980
Coal Use	2.83	4.60	16.91
TOTAL: Facilities	11	14	68
TOTAL: Megawatts	6,206	11,500	36,386
TOTAL: Coal Use	13.76	24.28	72.76

CUMULATIVE COAL USE	48.48	72.76
Illustrative market share volumes of cumulative total of coal demand		
40% of market	19.39	29.10
30% of market	14.54	21.82
25% of market	12.12	18.19
20% of market	9.69	14.55
15% of market	7.27	10.91

PACIFIC RIM UTILITY DEMAND FOR IMPORTED STEAM COAL

1990-1995

	1990-91	1992-93	1994-95	Cumulative Totals 1981-1995
JAPAN				
Facilities	8	2	3	59
Megawatts	5,281	3,000	3,600	36,242
Coal Use	10.88	6.40	8.32	71.55
KOREA				
Facilities	2	0	0	11
Megawatts	1,000	0	0	6,045
Coal Use	2.40	0	0	12.30
TAIWAN				
Facilities	1	1	1	16
Megawatts	1,100	1,100	1,300	10,480
Coal Use	2.37	2.23	3.35	24.86
TOTAL: Facilities	11	3	4	86
TOTAL: Megawatts	7,381	4,100	4,900	52,767
TOTAL: Coal Use	15.65	8.63	11.67	108.71

CUMULATIVE COAL USE	88.41	97.04	108.71
Illustrative market share volumes of cumulative total of coal demand			
40% of market	35.36	38.81	43.48
30% of market	26.52	29.11	32.61
25% of market	22.10	24.26	27.17
20% of market	17.68	19.40	21.74
15% of market	13.26	14.55	16.30

PACIFIC RIM UTILITY DEMAND FOR IMPORTED STEAM COAL

1996-1998+

		1996-97	1998+	Cumulative Totals 1981-98+
JAPAN				
	Facilities	3	1	63
	Megawatts	2,200	2,000	40,442
	Coal Use	4.62	4.20	80.37
KOREA				
	Facilities	0	0	11
	Megawatts	0	0	6,045
	Coal Use	0	0	12.30
TAIWAN				
	Facilities	3	6	25
	Megawatts	4,500	9,600	24,580
	Coal Use	9.17	23.80	57.83
TOTAL:	Facilities	6	7	99
TOTAL:	Megawatts	6,700	11,600	71,067
TOTAL:	Coal Use	13.79	28.00	150.50

CUMULATIVE COAL USE	122.50	150.50
Illustrative market share of cumulative total of coal demand		
40% of market	49.00	60.20
30% of market	36.75	45.15
25% of market	30.62	37.62
20% of market	24.50	30.10
15% of market	18.37	22.57

Appendix G

Taiwan Power's Official (1980) Projection for Coal Use at Existing and Planned Power Stations

Unit	Megawatts	Ultimate Annual Coal Use (Millions of Tons)	Minimum Heating Value (Btu/lb)	New Plant or Conversion ?	Now under Construction?	On-Line Date	Receiving Port	Maximum DWT
Shenao Nos. 1&2	200	1.27	11,160	--In operation--		1960/61	Keelung Harbor	35,000
Shenao No. 3	200		11,160	--In operation--		1966	Suao Harbor	35,000 (existing)
Peipu Nos. 1,3,4	75	0.05	11,160	--In operation--		1939/55/55	Keelung Harbor	35,000
Nanpu Nos. 1&2	80	0.69	11,160	--In operation--		1955/58	Kaohsiung Harbor	35,000
Nanpu No. 3	125		11,160	--In operation--		1963		
Linkou No. 1	300	1.26	11,160	--In operation--		1968	Taichung Harbor	63,000
Linkou No. 2	350		11,160	Conversion	Yes	1984		
Talin No. 1&2	600	3.64	10,500	Conversion	Yes	1984	Talin Coal Unloading Terminal	135,000
Talin Nos. 3&4	750		10,500	Conversion	Yes	1985		
Hsinta Nos. 1&2	1,000	5.41 (1990)	10,500	New	Yes	1982/83	Hsinta Coal Unloading Terminal	120,000 dwt until 1993, then 150,000
Hsinta Nos. 3&4	1,100		10,500	New	Yes	1985/86		
Hsinta Nos. 5&6	1,300	8.00–9.00	ND	New	No	1993/94		
Hsinta Nos. 7&8	2,000		ND	New	No	1999/2000		
Suao Nos. 1&2	1,100	11.58 (2000)	ND	New	No	1988	Suao Coal Unloading Terminal	200,000
Suao Nos. 3&4	1,100		ND	New	No	1991/92		
Suao Nos. 5&6	1,500		ND	New	No	1995/96		
Suao Nos. 7&8	2,000		ND	New	No	1999/2000		
Taichung Nos. 1&2	1,100	7.11 (2000)	ND	New	No	1987	Taichung Coal Unloading Terminal	135,000
Taichung Nos. 3&4	1,100		ND	New	No	1988/89		
Taichung Nos. 5&6	1,100		ND	New	No	1997/98		
Chang Hua Nos.	1,500	6.11 (2000)	ND	New	No	1996/97	Chang Hua Coal Unloading Terminal	200,000
Chang Hua Nos. 3&4	1,500		ND	New	No	1996/97		
Tong Kang Nos. 1&2	1,500	10.00 (2000)	ND	New	No	1997/98	Tong Kang Coal Unloading Terminal	200,000
Tong Kang Nos. 3&4	2,000		ND	New	No	1999/2000		
Hou Wan No. 1	1,000	2.22 (2000)	ND	New	No	2000	Hou Wan Coal Unloading Terminal	200,000

Source: Taiwan Power.
ND: Not decided.

This projection is presently undergoing revision to reflect changing economic trends in G.N.P. and energy growth rates.

Appendix H

Korea Electric's Planned Coal-Fired Power Stations

Unit	Megawatts	Ultimate Annual Coal Use (Millions of Tons)	Minimum Heating Value (Btu/lb)	New Plant or Conversion ?	Now under Construction?	On-Line Date	Receiving Port	Maximum DWT
Samcheonpo No. 1	560	1.35	10,260	New	Yes	1982	Samcheonpo	120,000
Samcheonpo No. 2	560	1.35	10,260	New	Yes	1983	Samcheonpo	120,000
Go-Jeong No. 1	500	1.20	10,260	New	Yes	1983	Go-Jeong	150,000
Go-Jeong No. 2	500	1.20	10,260	New	Yes	1984	Go-Jeong	150,000
Ho Nam	600	1.20	ND	Conversion	No	by 1985	Samcheonpo	120,000
Yeosu	1,000	0.80	ND	Conversion	No	by 1985	Samcheonpo	120,000
Yong Dong	325	0.40	ND	Conversion	No	by 1985	Bukpyeong	60,000
Coal Thermal No. 5	500	1.20	ND	New	No	1987	Samcheonpo or Go-Jeong	120,000 or 150,000
Coal Thermal No. 6	500	1.20	ND	New	No	1988		
Coal Thermal No. 7	500	1.20	ND	New	No	1990		
Coal Thermal No. 8	500	1.20	ND	New	No	1991		

Source: KECO.

ND: Not decided.

Appendix I

JAPANESE POWER STATIONS THAT CAN TAKE IMPORTED COAL

Power Company	Unit*	Megawatts	Ultimate Annual Coal Use (Millions of Tons)	Minimum Heating Value (Btu/lb)	New Plant or Conversion?	New Under Construction?	On-Line Date	Receiving Port	Maximum DWT
Hokkaido Electric	Tomatoazuma No. 2	600	1.26	10,800	New	Yes	1984	Tomatoazuma	60,000 (1983-89) ≥100,000 (1990)
	T-11	600	1.26	10,800	New	No	1987	Tomatoazuma	(See above)
Tohoku Electric	Sa I	350	0.74	10,800	New	No	1984	Sa I	60,000
	Sa II	350	0.74	10,800	New	No	1985	Sa II	60,000
	J	250	0.53	10,800	New	No	1986	J	60,000
	Noshiro No. 1	600	1.26	10,800	New	No	1987	Noshiro	60,000
	Noshiro No. 2	600	1.26	10,800	New	No	1990	Noshiro	(See above)
	Sendai Nos. 1,2,3	525	0.89	10,800	Dual-fired: increasing coal use			Unknown	Unknown
Hokuriku Electric	T-I	350	0.74	10,800	Conversion	No	1985	T-I	60,000
	X	250	0.53	10,800	Conversion	No	1985	X	60,000
	A	500	1.05	10,800	New	No	1986	A	60,000
	B	500	1.05	10,800	New	No	1987	B	60,000
Tokyo Electric	Y-1T	265	0.22	10,800	Conversion (COM)	Yes	1984	Onahama	60,000
	Y-2T	265	0.23	10,800	Conversion (COM)	Yes	1985	Onahama	(See above)
	H-I	1,000	2.10	ND	New	No	1988	H-I	100,000
	H-II	1,000	2.10	ND	New	No	1989	H-II	(See above)
Tokyo/Tohoku Electric	So I	1,000	2.10	ND	New	No	1989	So I	60,000
	So II	1,000	2.10	ND	New	No	1990	So II	(See above)

Power Company	Unit*	Megawatts	Ultimate Annual Coal Use (Millions of Tons)	Minimum Heating Value (Btu/lb)	New Plant or Conversion?	Now Under Construction?	On-Line Date	Receiving Port	Maximum DWT
Kansai Electric	E I	600	1.26	10,800	New	No	1989	E I	60,000
	E II	600	1.26	10,800	New	No	1989	E II	60,000
	E III	600	1.26	10,800	New	No	1989	E III	60,000
Chugoku Electric	Shin-Ube Nos. 2&3	231	0.49	10,800	Conversion	Yes	1981	Ube-Okinoyama Center	60,000
	Shin-Ube No. 1	75	0.16	10,800	Conversion	Yes	1982	(See above)	
	Mizushima No. 2	156	0.33	10,800	Conversion	Yes	1982	NK Center	≥100,000
	Mizushima No. 1	125	0.26	10,800	Conversion	Yes	1983	(See above)	
	Shin-Onoda No. 1	500	1.05	10,800	Conversion	Yes	1985	Ube-Okinoyma Center	60,000
	Shin-Onoda No. 2	500	1.05	10,800	Conversion	Yes	1986	(See above)	
	D	700	1.47	ND	New	No	1988	Unknown	Unknown
	Misumi No. 1	700	1.47	10,800	New	Yes	1989	Misumi	60,000
	Misumi No. 2	700	1.47	10,800	New	Yes	1990	Misumi	60,000
Kyushu Electric	Reihoku No. 1	700	1.47	ND	New	Yes	1988	Sakito	≥100,000
	Reihoku No. 2	700	1.47	ND	New	Yes	1989	Sakito	≥100,000
	Matsuura No. 1	700	1.47	10,800	New	Yes	1985	Matsuura	≥100,000
	Matsuura No. 2	700	1.47	ND	New	Yes	1990	Matsuura	(See above)
Shikoku Electric	Saijyo No. 1&2	406	0.86	10,800	Conversion	Yes	1983	N K Center	≥100,000
E.P.D.C.	Matsushima No. 1	500	1.05	10,800	New	--In Operation--		Matsushima	60,000
	Matsushima No. 2	500	1.05	10,800	New	--In Operation		Matsushima	(See above)
	Takehara No. 3	700	1.47	10,800	New	Yes	1982	Takehara	60,000

Power Company	Unit*	Megawatts	Ultimate Annual Coal Use (Millions of Tons)	Minimum Heating Value (Btu/lb)	New Plant or Conversion?	Now Under Construction?	On-Line Date	Receiving Port	Maximum DWT
E.P.D.C. (Con't.)	Ishikawa No. 1	156	0.33	10,800	New	Yes	1985	Ishikawa	≥30,000
	Ishikawa No. 2	156	0.33	10,800	New	Yes	1987	Ishikawa	(See above)
	Matsuura No. 1	1,000	2.10	10,800	New	Yes	1986	Matsuura	≥100,000
	Matsuura No. 2	1,000	2.10	10,800	New	Yes	1990	Matsuura	(See above)
Sumitomo Kyoka	Niihama-Shinhigashi	185	0.39	10,800	New	Yes	1984	N K Center	≥100,000
Chubu Electric	GI & II	1,200	2.52	ND	New	No	1989	Nanseicho	≥100,000
Okinawa	A-1	156	0.33	ND	New	No	1990	A-1	≥30,000

ND: Not determined.

*Japan Coal Development Company wishes to protect the actual identity of certain power-plant units. These units have been coded by JCD. The JCD codes begin with the following letters: T, S, J, X, A, B, Y, II, E, and G. In the case of Chugoku Electric, the unit identified by the Letter "D" (and not the letters "DTG") is also one whose identify JCD wishes to protect.

Power Company	Unit*	Megawatts	Ultimate Annual Coal Use (Millions of Tons)	Minimum Heating Value (Btu/lb)	New Plant or Conversion?	Now Under Construction?	On-Line Date	Receiving Port	Maximum DWT
Hokkaido Electric	DTG-1	450	1.08	ND	New	No	post-1990	Unknown	Unknown
	DTG-2	350	1.08	ND	New	No	post-1990	Unknown	Unknown
Tokyo/Tohoku Electric	DTG-3	2,000	1.10	10,800	New (COM, gas, oil)	No	pre-1985	Onahama	60,000
	DTG-4	1,000	2.10	ND	New	No	post-1995	Kitaibaragi	≥100,000
Kansai Electric	DTG-5	66	0.15	10,800	Conversion	Yes	1982	Unknown	Unknown
	DTG-6	1,000	2.20	ND	New	No	post-1990	Unknown	Unknown
Chugoku Electric	DTG-7	700	1.47	ND	New	No	post-1990	Misumi	60,000
	DTG-8	175	0.48	10,800	Conversion	--In operation--		Unknown	Unknown
	DTG-9	500	1.05	ND	New	No	post-1990	Unknown	Unknown
E.P.D.C.	DTG-10	2,000	4.20	ND	New	No	1993	Central Coast	Unknown
	DTG-11	2,000	4.20	ND	New	No	1995-99	Northeast Coast	Unknown
	DTG-12	2,800	6.16	ND	New	No	post-1990	West Coast	Unknown
	DTG-13	350	0.34	10,800	Conversion (COM)	No	1984	Unknown	Unknown
Tohoku Electric	DTG-K	600	1.26	ND	New	No	1991	Noshiro	60,000
Joban Kyodo	Nakoso No. 8	600	0.60	10,800	Conversion (COM)	Yes	1983	Onahama	60,000
	Nakoso No. 9	600	0.60	10,800	Conversion (COM)	Yes	1983	Onahama	(See above)
Tomakomai Kyodo	Tomakomai No. 1	500	1.10	ND	New	Unknown	1984	Tomakomi Center	60,000(1983-89) 100,000(1990)
	Tomakomai No. 2	500	1.10	ND	New	Unknown	1986	Tomakomai Center	(See above)

ND: Not determined.

*The Demand Task Group has learned of the potential for use of imported coal at certain power-plant units that are not officially recognized by Japanese power companies. For the sake of completeness, the Task Group has included information on these units. These units are identified by the codes beginning with the letters DTG, or by a unit name such as Nakoso and Tomakomai. The source of this information is both Japanese trading companies and banks.

Appendix J

FORECAST of ELECTRIC ENERGY DEMAND

and

EXPANSION PLAN of ELECTRIC GENERATING CAPACITY

September, 1981

Compiled by the

Federation of Electric Power Companies

Table 1. Forecast of Electric Energy Demand

Fiscal Year *		1980	1985	1990	Annual Rate of Energy Increase (%)	
					1980~1985	1985~1990
Electric Energy Sales (million KWH)	all electric utilities	464,253	626,275	818,567	6.2	5.5
	nine electric power companies	433,444	589,070	779,454	6.3	5.8
Peak Demand in August (MW)	all electric utilities	89,103	132,351	175,736	8.2	5.8
	nine electric power companies	84,919	127,570	170,650	8.5	6.0

* The Fiscal Year begins April 1 of the year and ends March 31 of the next year.

Table 2 Electric Energy Forecast of Nine Electric Power Companies

Names of Companies / Fiscal Year	Electric Energy Sales(10^6KWH)					Peak Demand(10^3KW)		
				Annual Rate of Increase(%)				
	1980	1985	1990	1980-1985	1985-1990	1980	1990	1980-1990
Hokkaido E.P.Co.	16,265	21,812	29,867	6.0	6.5	2,584	5,260	7.4
Tohoku E.P.Co.	37,578	51,310	70,759	6.4	6.6	5,860	12,750	8.1
Tokyo E.P.Co.	131,123	181,810	239,300	6.8	5.6	27,280	54,920	7.2
Chubu E.P.Co.	64,268	84,400	112,520	5.6	5.9	12,904	25,230	6.9
Hokuriku E.P.Co.	15,853	21,980	30,118	6.8	6.5	2,668	6,000	8.4
Kansai E.P.Co.	81,255	108,403	140,437	5.9	5.3	17,414	33,330	6.7
Chugoku E.P.Co.	33,062	46,185	61,103	6.9	5.8	5,884	12,450	7.8
Shikoku E.P.Co.	16,118	21,080	26,830	5.5	4.9	2,925	5,560	6.6
Kyushu E.P.Co.	37,923	52,090	68,520	6.6	5.6	7,400	15,150	7.4
Total	433,444	589,070	779,454	6.3	5.8	84,919	170,650	7.2

Table 3. *Expansion Plan of Electric Generating Capacity for the Next Decade

(1,000KW)

	Expansion of Generating Capacity during F.Y. 1980 through F.Y. 1990	Expansion for each 5 years	
		F.Y. 1980 ~ F.Y. 1985	F.Y. 1985 ~ F.Y. 1990
Nuclear	% 35,410 (33.6)	% 12,370 (27.4)	% 23,040 (38.5)
Hydroelectric	16,930 (16.1)	9,360 (20.7)	7,570 (12.5)
Thermal	53,030 (50.3)	23,410 (51.9)	29,620 (49.2)
Coal	17,880 (16.9)	3,130 (6.9)	14,750 (24.5)
LNG	21,080 (20.0)	8,260 (18.3)	12,820 (21.3)
LPG	2,500 (2.3)	1,500 (3.4)	1,000 (1.7)
Geothermal	1,250 (1.2)	270 (0.6)	980 (1.6)
Oil	10,320 (9.9)	10,250 (22.7)	70 (0.1)
Total	105,370 (100)	45,140 (100)	60,230 (100)

* Expansion plan shown above, contains those of nine electric power companies, Electric Power Development Company and Japan Atomic Power Company.

Table 4. Forecast of Generating Capacity by Type

(1,000KW)

As of the end of Fiscal Year	1980	1985	1990
Nuclear	15,510 (12.0)%	27,880 (15.8)%	50,920 (21.7)%
Hydroelectric	28,670 (22.2)	38,170 (21.7)	45,710 (19.5)
Ordinary	17,850 (13.8)	19,370 (11.0)	21,320 (9.1)
Pumped Storage	10,810 (8.4)	18,800 (10.7)	24,390 (10.4)
Thermal	85,180 (65.8)	110,320 (62.5)	137,930 (58.8)
Coal	5,260 (4.1)	12,500 (7.1)	29,560 (12.6)
LNG	19,710 (15.2)	32,390 (18.4)	45,960 (19.6)
LPG	600 (0.5)	2,700 (1.5)	4,700 (2.0)
Geothermal	130 (0.1)	400 (0.2)	1,380 (0.6)
Oil	59,480 (46.0)	62,330 (35.3)	56,330 (24.0)
Total	129,360 (100)	176,370 (100)	234,560 (100)

Table 5. Expansion Plan of LNG Power Plant

	F.Y. 1980 end (March 31, 1981)	Newly Construction Plants during F.Y. 1981 through F.Y. 1985	F.Y. 1981~F.Y. 1985 to be scrapped	F.Y. 1985 end	Newly Construction plants during F.Y. 1986 through F.Y. 1990	F.Y. 1990 end
Capacity (1000KW) (Numbers of Units)	19,709 (48)	12,681 (28)		32,390 (76)	13,570 (18)	45,960 (94)
Name of the Power Station		(Newly Construction) Higashi Niigata 2,3T (1,690) Chita No.II 1,2T (1,400) Shin-Kokura 5T (600) Hirono 3,4T (2,000) Futtsu 1,2T (2,015) Other 1 units (560) (Sub-Total 8,265) (Conversion from Oil-fired) Chita 3T (500) Nigata-ko 1,2T (700) Kawasaki 1~6T Yokohama 1~6T (2,275) Himeji No.I 3,4T (281) Other 1 units (660) (Sub-Total 4,416)			(Newly Construction) Yanai 1,2T (1,400) Shin-Ohita 1,2T (1,400) Higashi-Ohgishima 1,2T (2,020) Other 12 units (8,750)	

Table 6. Expansion Plan of Nuclear Power Plant

(1,000KW)

	F.Y. 1980 end (March 31. 1981)	Newly Construction Plants during F.Y. 1981 through F.Y. 1985	F.Y. 1985 end	Newly Construction Plants during F.Y. 1986 through F.Y. 1990	F.Y. 1990 end
Capacity (1,000 KW)	15,511	12,370	27,881	23,038	50,919
Numbers of Units	(22)	(13)	(35)	(23)	(58)
Name of the Power Station		Onagawa 524 Fukushima No.II 1 4T 4,400 Kashiwazaki-Kariha 1T 1,100 Takahama 3,4T 1,740 Igata 2T 566 Sendai 1,2T 1,780 Hamaoka 3T 1,100 Tsuruga 2T 1,160		Kashiwazaki-Kariha 2,5T 2,200 Shimane 2T 820 Kyowa-Tomari 1,2T 1,158 Maki 825 Namie-Odaka 825 Igata 3T 890 Genkai 3T 1,180 Shimokita 1T 1,100 Notb 1T 540 Other 12 units 13,500	

Table 7. Present Status of Nuclear Power . nts in Japan (Electric Utilities only)

(as of June 1, 1981)

	Name of Utilities	Name of Power Station	Location	Type of Reactor	Authorized Capacity (MW)	Construction Permit	Commercial Operation
Operation	Japan Atomic Power Co.	Tokai	Ibaragi Pref.	GCR	166	Mar., 1961	July, 1966
	"	Tokai No.2	"	BWR	1,100	Apr., 1973	Nov., 1978
	Tokyo Elect. Power Co.	Tsuruga (No.1)	Fukui Pref.	"	357	Feb., 1967	Mar., 1970
	Tokyo Elect. Power Co.	Fukushima No.1 (No.1)	Fukushima Pref.	"	460	Sept.,1967	Mar., 1971
	"	" (No.2)	"	"	784	May, 1969	July, 1974
	"	" (No.3)	"	"	784	Oct., 1970	Mar., 1976
	"	" (No.4)	"	"	784	May, 1972	Oct., 1978
	"	" (No.5)	"	"	784	Dec., 1971	Apr., 1978
	"	" (No.6)	"	"	1,100	Mar., 1973	Oct., 1979
	Chubu Elect. Power Co.	Hamaoka (No.1)	Shizuoka Pref.	"	540	Feb., 1971	Mar., 1976
	"	" (No.2)	"	"	840	Sept.,1073	Nov., 1978
	Kansai Elect. Power Co.	Mihama (No.1)	Fukui Pref.	PWR	340	Aug., 1967	Nov., 1970
	"	" (No.2)	"	"	500	Dec., 1968	July, 1972
	"	" (No.3)	"	"	826	July, 1972	Dec., 1976
	"	Takahama (No.1)	"	"	826	Apr., 1970	Nov., 1974
	"	" (No.2)	"	"	826	Feb., 1971	Nov., 1975
	"	Ohi (No.1)	"	"	1,175	Oct., 1972	Mar., 1979
	"	" (No.2)	"	"	1,175	Nov., 1972	Dec., 1979
	Chugoku Elect. Power Co.	Shimane (No.1)	Shimane Pref.	BWR	460	Feb., 1970	Mar., 1974
	Shikoku Elect. Power Co.	Ikata (No.1)	Ehime Pref.	PWR	566	Apr., 1973	Sept.,1977
	Kyushu Elect. Power Co.	Genkai (No.1)	Saga Pref.	"	559	Mar., 1971	Oct., 1975
	"	" (No.2)	"	"	559	May, 1976	Mar., 1981
	Sub-total			(22)	15,511		
Under Construction	Tohoku Elect. Power Co.	Onagawa	Miyagi Pref.	BWR	524	May, 1971	June, 1984 (Scheduled)
	Tokyo Elect. Power Co.	Fukushima No.2 (No.1)	Fukushima Pref.	"	1,100	Aug., 1975	May, 1982 (")
	"	" (No.2)	"	"	1,100	Jan., 1979	Jan., 1984 (")
	"	" (No.3)	"	"	1,100	Nov., 1980	July, 1985 (")
	"	" (No.4)	"	"	1,100	Nov., 1980	Feb., 1986 (")
	"	Kashiwazaki-Kariha (No.1)	Niigata Pref.	"	1,100	Nov., 1978	Oct., 1985 (")
	Kansai Elect. Power Co.	Takahama (No.3)	Fukui Pref.	PWR	870	Nov., 1980	Feb., 1985 (")
	"	" (No.4)	"	"	870	Nov., 1980	Aug., 1985 (")
	Shikoku Elect. Power Co.	Ikata (No.2)	Ehime Pref.	"	566	Dec., 1972	Mar., 1982 (")
	Kyushu Elect. Power Co.	Sendai (No.1)	Kagoshima Pref.	"	890	Nov., 1978	July, 1984 (")
	"	" (No.2)	"	"	890	Mar., 1981	Mar., 1986 (")
	Sub-total			(11)	10,110		
Under Planning	Japan Atomic Power Co.	Tsuruga (No.2)	Fukui Pref.	PWR	1,160		Mar., 1986 (")
	Tokyo Elect. Power Co.	Kashiwazaki-Kariha (No.2)	Niigata Pref.	BWR	1,100		Apr., 1989 (")
	"	" (No.5)	"	"	1,100		Oct., 1989 (")
	Chubu Elect. Power Co.	Hamaoka (No.3)	Shizuoka Pref.	"	1,100		Mar., 1986 (")
	Chugoku Elect. Power Co.	Shimane (No.2)	Shimane Pref.	"	820		Sept.,1988 (")
	Sub-total			(5)	5,280		
Grand-Total				(38)	30,901		

Tables 5, 6, and 7 are subject to revision and modification dependent on a variety of circumstances in the permitting to construction cycle.

Appendix K

JAPANESE STEEL INDUSTRY PROJECTED NON-COKING COAL CONSUMPTION

Japanese Steel Industry
(Including Gas & Coke Industry)
(1,000 MT)

		'1981		'1982	'1983	'1984	'1985	'1990
1.	Petroleum Coke	550						
2.	Non-coking coal	3,450	4,000	4,500	4,800	4,800	5,000	6,000
	(U.S.-Western Coal)	(2,200)						

Remarks:

1. Above tonnage is a sum up of estimated consumption by each steel mill.
2. Consumption of gas and coke industry is estimated to be 200,000.
3. Coal consumption may increase depending on future technical development.
4. Major applications of coal
    a. Briquetting
    b. Injection into blast furnaces
        (Pulverized Coal Injection)
        (Coal and Oil Mixture)
        (Coal and Tar Mixture)
    c. Coal prepartion control process
    d. Conventional cokemaking

Conditions:

The following conditions must be satisfied.

1. Prices must be competitive with coals supplied by other sources.
2. Infrastructure, including railroad and port facilities, must be adequate.

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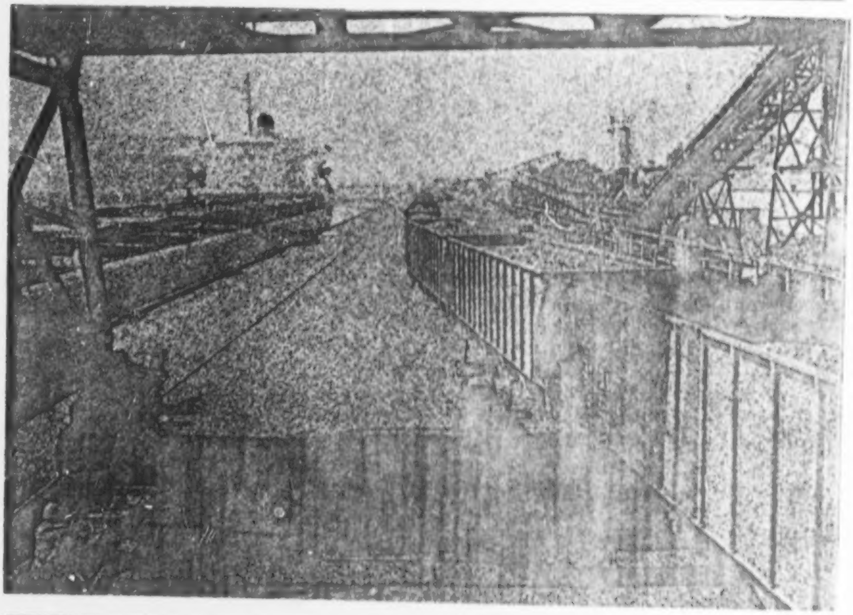

Western U.S. Steam Coal Exports to the Pacific Basin: Port and Marine Task Group

Prepared by the Port and Marine Task Group
Western Coal Export Task Force
Pacific Basin Steam Coal Export Study

Technical Assistance by
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Chapter 1

INTRODUCTION AND EXECUTIVE SUMMARY

A. Introduction

Export of coal from the west coast of the U.S. presents a challenge and an opportunity. It is a challenge because there currently are no major bulk export facilities on the coast which were specifically designed as coal terminals. Therefore, all the coal tonnage shipped from the west coast is moving through multi-product bulk facilities that have been adapted to the use of coal. This situation also presents an opportunity in that modern, state of the art material handling techniques can be incorporated in the design of the west coast export terminals.

The Port and Marine report analyzes this situation as well as other important elements of the western coal export transportation system. The three elements examined are the west coast U.S. exporting ports, the Pacific Rim (Japan, Korea, Taiwan) receiving ports and the vessel transportation that connects the two. All are summarized in this first chapter, and each is explored in detail in the body of the report.

Chapter 2 is a general discussion of coal export facilities, their hypothetical capital and operating costs, the timing required for development, and environmental issues that must be considered when contemplating development of a coal terminal on the west coast of the United States.

This is followed by descriptions of existing bulk facilities at Long Beach, Los Angeles and Stockton, California, which are currently capable of loading export coal. Chapter 3 also includes a description of the coal terminal at Roberts Bank, Vancouver, B.C. as well as Canadian plans for expanded west coast export capacity.

Chapter 4 presents the 26 sites along the U.S. west coast which have been proposed for new coal terminal development. The site descriptions represent summaries of owners' responses to queries concerning availability and suitability of terminal sites. A brief discussion of a port's ability to accommodate a given vessel size is also included.

The cost of ocean transport in the movement of western coal to Pacific Rim users is addressed in Chapter 5. The economic advantages of large vessels are noted, and new technologies in vessel design which may affect costs or operations are also discussed.

Finally, Chapter 6 examines the existing and planned receiving facilities in Japan, Korea and Taiwan. The discussion focuses on their capacity to handle potential demand as well as the implications for the size of vessels which can be expected in the Pacific coal trade.

B. Executive Summary

1. The Coal Export Facility

Design

Modern, high capacity coal export facilities are designed so that vessel loading and inland coal delivery are entirely separated from one another. Neither train nor ship must await the arrival of the other.

This independence is achieved by use of interim ground storage which provides surge capacity between the two transport modes. That is, railcars deliver the coal to the terminal, are emptied on arrival and return immediately to the coal fields. When a ship arrives the material is rapidly reclaimed from ground storage and the vessel is loaded.

Capital Cost

The actual capital cost of a specific coal export terminal will vary substantially depending on the site characteristics and configuration and the required handling capabilities. Generally, capital costs for a major new development range from $7 to $12 per ton of designed annual throughput capacity. Included in this range are land acquisition, engineering, construction and construction management, interest during construction and legal fees. Offsite improvements are not included.

It should be noted, however, that these cost estimates offer only a "rule of thumb." Experience has shown that due to favorable conditions some facilities can be constructed for less while adverse physical site conditions can cause costs to exceed the norm.

Direct Operating Cost

Operating costs for a new export terminal range from $.80 to $1.50 per ton, and economies of scale result in facilities with higher throughputs operating at the lower end of the range. These direct operating costs do not include debt amortization or interest expenses, facilities depreciation, or allowance for owner's profit. Typical operating distribution is:

Labor and burden	50%
Supplies	20%
Insurance and taxes	20%
Miscellaneous	10%

Environmental

All coal terminals have the potential to affect air and water quality and to increase ambient noise levels. These issues may prove more significant for some layouts and for some locations than for others, however; a case by case evaluation is required. Techniques, including careful facility design and the use of control systems, are available to minimize air, water and noise impacts.

Other considerations, such as archaeological remains on-site or degradation of valuable biological habitats, apply generally to large-scale industrial development and are best minimized by careful site selection. Again, a case by case examination is necessary.

2. Existing Western Export Capability

West coast coal loading facilities currently in operation are located at Los Angeles and Long Beach, California, and at Vancouver, British Columbia. The Port of Stockton, California, has an existing dry bulk terminal now available for loading export coal.

United States

The Port of Long Beach facility has a present capacity of three million tons per year, and expansion underway will increase annual throughput capability to approximately five million tons. Vessels up to 70,000 deadweight tons (DWT) can now be accommodated, and upon completion of improvements ships over 100,000 tons will be loaded. Full additional capacity will be available by late 1982 at an estimated cost exceeding 10 million dollars.

At the Port of Los Angeles the existing bulk terminal can load 1.7 million tons of coal annually into vessels up to 120,000 deadweight tons(DWT). Although expenditure commitments for expansion are not finalized, the port is planning to improve the facility to handle up to five million tons per year by 1984.

The bulk loading terminal at Stockton offers storage for 100,000 short tons and ability to load 20,000 to 30,000 short tons into vessels with drafts up to 32 feet. Stockton, Los Angeles and Long Beach are all planning entirely new terminals in addition to the latter two ports' expansion projects.

Canada

The three existing western Canadian coal handlers are Neptune Bulk Terminals Ltd. and Pacific Coast Terminals Ltd. in Vancouver's main harbor and Westshore Terminals Ltd. to the south at Roberts Bank. They currently have combined annual throughput capacity of approximately 20 million tons.

The two Vancouver facilities are not expected to expand due to physical constraints, but the National Harbours Board has announced that Roberts Bank will quadruple in size by 1985. This growth will allow for at least an additional 11 million tons of coal per year plus other dry bulk commodities.

3. Potential New U.S. Sites

Twenty-six ports and/or private property owners on the U.S. Pacific Coast indicate that they are actively investigating coal terminal development. Based on property owner's input, physical characteristics and project plans for each are summarized by state in figures 1.1, 1.2 and 1.3.

The large number of announced projects clearly exceeds forecast demand; if all were to be constructed on schedule, a substantial over-capacity would exist, based on current projections of export demand.

With the exception of Puget Sound, water depth with resultant vessel size limitations is a key issue for west coast ports. Still, it is only a component of the overall transportation system. Considerations of expected vessel size at any given site must include operational flexibility due to overdredging or tidal advantage, ship variations such as wide body/shallow draft design, and potential future channel deepening.

Due to ongoing debates over federal dredging policy, the likelihood, cost and timing of this last factor is uncertain except for those ports, such as Los Angeles and Long Beach, which have committed themselves to finance deepening projects.

4. Site Selection

Each potential site has strengths and limitations relative to acquisition and development costs, permit likelihood, length and condition of rail links to specific coal fields, and vessel size ac-

Figure 1.1

CALIFORNIA TERMINAL SITES

LOCATION	OWNER	SIZE (Acres)	EXISTING CHANNEL DEPTH (feet)	RAIL SERVICE*	PLANNED CAPACITY (MTPY)**	COMMISSION DATE	DEVELOPER
Long Beach	Upland Industries	100+	60	UP, SF, SP	10 (Phase I) 30 (Ultimate)	1984 N.A.	Upland, Port, Crowley Maritime, Metropolitan Stevedore, C. Itoh
Los Angeles	Port	190	45	UP, SF, SP	10-15 (Phase 1) 20-30 (Ultimate)	1985 1990	N.A.
Port Hueneme	Port	60+	35	SP via Ventura County RR	N.A.	N.A.	N.A.
San Francisco	Port	70	50	SP	10+	N.A.	Bayshore Bulk
Redwood City	Port (Phase 1) Private (Ultimate)	10 200+	32	SP	1.5-2 (Phase 1) 20-30 (Ultimate)	1982 1986	N.A.
Richmond	Port	N.A.	35	SF, SP	N.A.	N.A.	N.A.
Selby	Wickland Oil	308	35	SP	15	1985	N.A.
Benicia	Benicia Industries	150	35	SP	N.A.	N.A.	N.A.
Sacramento	Port (Phase 1) Private (Ultimate)	10+ 300+	32	SP, WP	2.5-3 (Phase 1) 5-10 (Ultimate)	N.A. N.A.	N.A.
Stockton	Port	73	32	SF, SP, WP	5	1983	N.A.

N.A. = Not Available.

*UP = Union Pacific; SP = Southern Pacific; SF = Santa Fe; WP = Western Pacific.

**MTPY = Million Tons Per Year.

Figure 1.2

OREGON TERMINAL SITES

LOCATION	OWNER	SIZE (Acres)	EXISTING CHANNEL DEPTH (feet)	RAIL SERVICE*	PLANNED CAPACITY (MTPY)**	COMMISSION DATE	DEVELOPER
Coos Bay	Port	70	35	SP	12	N.A.	Canasia Coal Company
Warrenton	Dant & Russel	130	40	BN	3-5 (Phase I) 10-11 (Ultimate)	1986 1990	N.A.
Astoria	State (Site 1) Federal Gov't (Site 2) Port/State (Site 3)	55 136 150+	40	BN	N.A.	N.A.	N.A.
Portland	Port	110	40	UP, BN	9	1982 (Construction)	Pacific Coal Corporation

N.A. = Not Available.

*SP = Southern Pacific; BN = Burlington Northern; UP = Union Pacific.

**MTPY = Million Tons Per Year.

Figure 1.3

WASHINGTON TERMINAL SITES

LOCATION	OWNER	SIZE (Acres)	EXISTING CHANNEL DEPTH (feet)	RAIL SERVICE*	PLANNED CAPACITY (MTPY)**	COMMISSION DATE	DEVELOPER
Vancouver	Port	100-160	40	UP, BN	5-10	1984 potential	N.A.
Kalama	Port	175	40	UP, BN	15	1984	Pacific Resources
Longview	Private	325	40	UP, BN via Longview Switching Co.	N.A.	N.A.	N.A.
Grays Harbor	Port	176	30	UP, BN	10	1986	N.A.
Bellingham	Private	1,000	80+	BN	N.A.	N.A.	N.A.
Anacortes	N.A.	N.A.	80+	BN	N.A.	N.A.	N.A.
Tulalip	Tulalip Tribes	1,300	80+	BN	15 (Phase I) 45 (Ultimate)	1986	N.A.
Everett	Port	1,800	80+	BN	N.A.	N.A.	N.A.
Tacoma	Port	90	80+	UP, BN	N.A.	N.A.	N.A.
West Tacoma	Lone Star Industries	100	80+	UP, BN	N.A.	N.A.	N.A.
Dupont	Weyerhaeuser	3,200	80+	UP, BN	N.A.	N.A.	N.A.

N.A. = Not Available.

*UP= Union Pacific; BN = Burlington Northern.

**MTPY = Million Tons Per Year.

commodated. The combined effect of all these factors must be evaluated. The export terminal is but a single link in the lengthy coal chain; selection of a site is dependent upon which location fits into the least cost system overall for a given user.

Currently there are no major coal terminals on the west coast of the United States. This allows facilities developers great flexibility to design and construct a facility that will fulfill the users' requirements. The selection of a site on which to develop a coal terminal includes the evaluation of several factors. The relative importance of each individual factor must be determined, weighed against the developers' and/or terminal users' objectives, and then assessed to determine the most desirable terminal development site. The major factors that should be considered in selecting an export coal terminal site are outlined below:

I. Physical Site Characteristics

   A. Geology and soil bearing capacity
   B. Topography
   C. Hydrology
   D. Meteorology

II. Environmental Characteristics/Permit Requirements

   A. Air quality requirements
   B. Water quality requirements
   C. Noise restrictions
   D. Status of Flora and Fauna
   E. Archaeological resources on or near the site
   F. Aesthetics of the area
   G. Applicable codes and ordinances for facility construction and operation
   H. Land use plans
   I. Zoning of site

III. Railroad Characteristics

- A. Serving railroad
- B. Proximity of site to rail service
- C. Rail distance from potential coal sources
- D. Rail/Vehicular traffic conflicts
- E. Size and description of trains
- F. Train turn-around time requirements

IV. Vessel and Marine Characteristics

- A. Entrance channel and berth depth
- B. Type and size of vessel that can be accommodated
- C. Navigational characteristics and restrictions
- D. Availability of pilots, tugs and other ship services

V. Capital Cost Characteristics

- A. Land acquisition cost
- B. Site preparation cost
- C. Facilities cost
- D. Dock and marine structures cost
- E. Dredging cost
- F. Financing cost
- G. Owners/Developers profit objectives

5. Ocean Transportation

Several nonstandard technological approaches are being explored for the ocean transport of coal. These include wide body/shallow draft designs, self-unloaders, coal-fired colliers, and slurry "tankers." It appears, however, that most ship orders in the near future will be for carriers of conventional configuration and propulsion.

A large international dry bulk fleet is available to carry export coal to consuming nations. Furthermore, intensified shipbuilding activity indicates that the expected growth in trade will also be readily accommodated. Since construction time for a new vessel is approximately two years, considerably less than for a new coal terminal, ship supply is not expected to be a constraint to the export market.

Significant economies of scale exist for ocean transport. Therefore, per ton savings can accrue for coal moving in larger vessels. Shipments of 150,000 tons could move through prospective terminals in southern California and in Puget Sound. Once again, however, vessel cost is only one part of the total movement which must be considered. Moreover, many ports, on both sides of the Pacific, cannot accommodate vessels larger than about 60,000 DWT. Since a large portion of projected Pacific Rim imports in 1990 is expected to be delivered in these Panamax or smaller vessels, ships of this size as well as the larger carriers appear to have important roles in the market.

Voyage duration is the second major factor in ocean transport costs. Due to relative distances involved, Panamax carriers from the west coast can deliver coal to the Pacific Rim market for approximately one-half the cost of comparably sized vessels departing Gulf or east coast origins.

6. Pacific Rim Coal Import Terminals

The Pacific Rim coal consuming nations are all taking measures to ensure a continued ability to receive forecast imports so discharge port facilities appear to present no constraint for the coal trade. The anticipated 1990 status of the Pacific Rim countries' receiving ports is summarized below.

Japan's coal port development plan calls for receiving coal at a total of 20 ports divided into these categories: coal centers, electric power ports, and public or privately operated ports. Korea plans the development of two major electric power ports and four regional public or private ports. Taiwan's program is to develop one coal center and two electric power ports, and to continue the operation of the four public coal unloading ports.

Despite shipping economies, due to overall operational and cost considerations, none intends to rely exclusively on that portion of the world fleet which is 100,000 DWT or larger. On the contrary, over 40 percent of the three nations' projected 1990 coal unloading capability is expected to be for Panamax or smaller vessels. This has significance for decision-makers, both those considering future additions to the world fleet and those evaluating potential west coast sites for export terminal development.

Chapter 2

BACKGROUND: THE COAL EXPORT FACILITY

A. Terminal Types

There are two types of coal export facilities which differ in basic concept. One type receives coal via truck, railroad or barge and transfers the coal directly from the delivery vehicle to the sea transport. The other type of terminal receives coal similarly, but the coal is unloaded and temporarily stored. The stored coal is later reclaimed for loading onto the vessel.

1. Variation in Types of Coal

One cause for difference in layout is the type of coal to be handled. There are two major uses for exported coal.

Metallurgical coal is used to make coke, which is in turn used in the steel-making process. Hundreds of different grades of coal are used for coking. Usually these coals are blended to achieve the unique characteristics needed by the process. Since so many diverse blends are required, the final mix of coal is a result of blending coals from several different sources. The volumes to be handled and the number of types which make up the final blend dictate whether ground storage or segregation of materials in the arriving railcar is preferable.

Steaming coal, that is coal used for power generation, is not subject to the same diversity of types or the complexity of blending and mixing.

Therefore, terminals which primarily handle steaming coal do not require as much product segregation, and storage is simplified.

2. Coal Handling Development in the U.S.

The first mechanized coal handling and shiploading facilities in the United States were developed by railroad operating companies as an extension of their coal transport services. Ships of the day were relatively small, and direct loading from rail to ship was entirely feasible. The material was received at the terminal in railcars and remained in the car until it was to be loaded aboard ship. In the meantime, cars were arranged in the marshalling yard in shiploading order. Upon ship arrival, the loading sequence was begun directly from the railcars. This system has certain intrinsic problems. The entire shiploading cycle is dependent upon the supply of coal stored in cars and the rate with which these cars can be unloaded. Further, the complexity of the railcar handling leads to great inefficiencies.

With the development of machinery that allows efficient, high speed stockpiling of material in storage and reclaiming for shiploading, it became practical to design terminals wherein the operation of the inbound transportation could be divorced from the shiploading function. At this type of terminal, coal is received in railcars, cars are emptied upon arrival and the coal is stored in the storage yard. Since many piles can be made, discrete coal types needing segregation can be stored. Railcars are never held in the yard for long periods of time and, therefore, have a much better utilization record than railcars used in the system without storage.

When a ship arrives and is ready for loading, the material is rapidly reclaimed from ground storage, and the vessel is loaded. The capacity of the shiploading system is specifically designed to achieve the optimum benefit/cost ratio, taking into account vessel demurrage costs.

Major coal export terminals presently in operation on the east coast are direct rail-to-water type. All major coal export terminals outside of the United States are the ground-to-storage-to-water type.

3. Coal Terminal without Storage

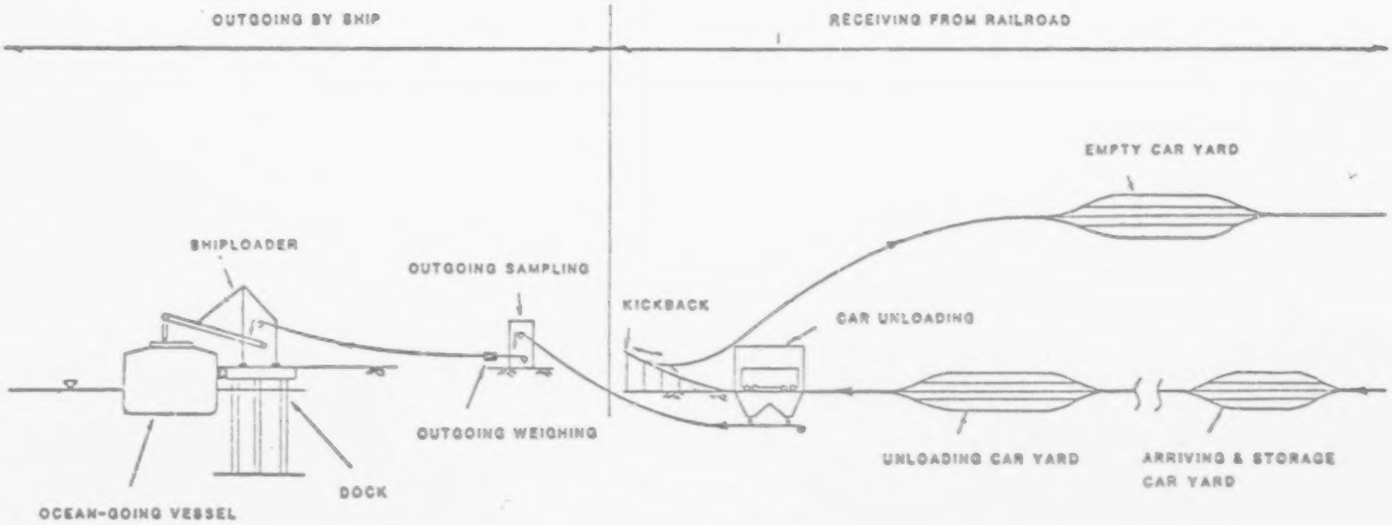
Figure 2.1 is a schematic illustration of the primary elements of a coal terminal without storage. Material is received in railcars, which are placed in an arriving car yard. The material in each car is known ahead of time and made part of a specific shiploading cargo plan. This plan establishes the order of shiploading from start to finish and forms the basis of arrangement of cars in the unloading yard. When the ship arrives and is ready for loading, the prearranged railcars are dumped and the coal is carried to the ship via belt conveyors and deposited in the hold with a shiploader which can load selectively in any hold. After a railcar is emptied, it is shunted into an empty car yard to await empty car train makeup and return to the mine.

This operation is labor intensive. Workers are needed to release and shift railcars and to remake trains in addition to the workers required for shiploading operations.

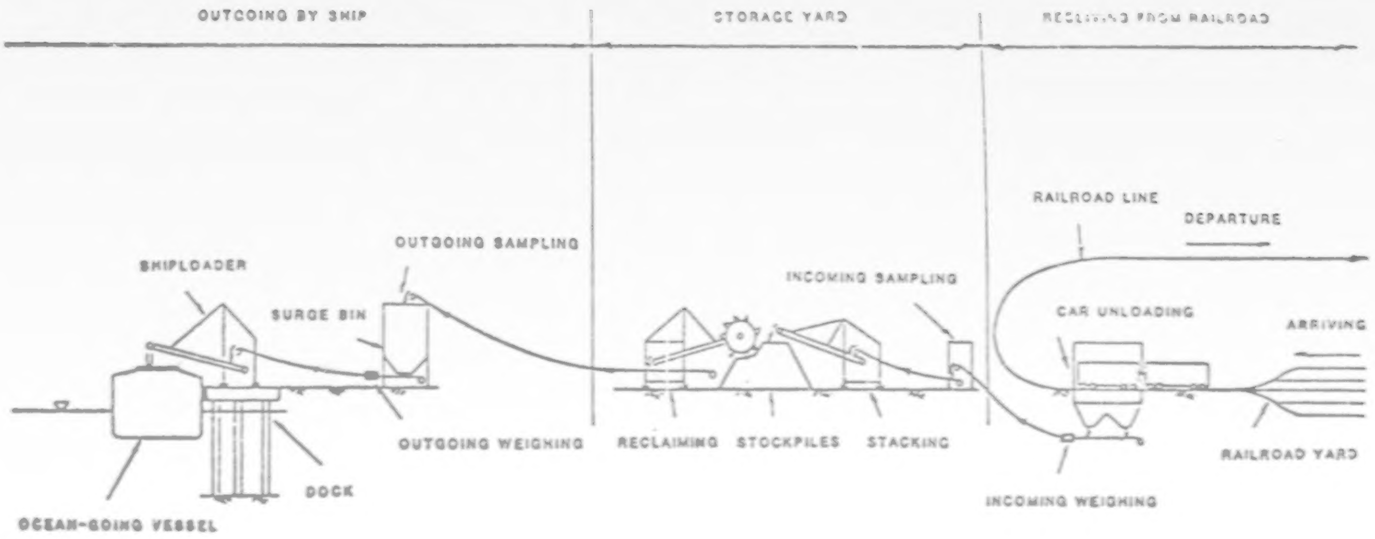
4. Coal Terminal with Storage

Figure 2.2 illustrates the principle of a terminal utilizing ground storage. These terminals may be designed to receive single product trains, each consisting of 100 or more 100-ton cars, or cars may be received randomly and unloaded in a group.

Figure 2.1



COAL EXPORT PORT SCHEMATIC
WITHOUT GROUND STORAGE



COAL EXPORT PORT SCHEMATIC
WITH GROUND STORAGE

Unit trains usually circuit a loop track which has a car dumper. Cars are unloaded rapidly by automated or semi-automated systems. Unit trains of 10,000 tons can be completely unloaded in three to four hours. The coal is carried by belt conveyor to the storage yard and stacked. After dumping, the train leaves the site. There is no need to provide train storage space. The loop track, however, is usually laid out so that the entire unit train can be accommodated within the property limits on each side of the car dumper. This does not create a problem if the ground storage areas are large enough to provide loop track space around the storage piles.

Alternatively, trains with several grades of coal can be handled. Cars are segregated by product types in a reception yard. They are then unloaded in blocks by product type by automated or semiautomated means. Each product is stacked on the ground in a discrete area so that it can be identified and reclaimed. After unloading, the empty cars are made up into a train prior to departure from the site. This arrangement requires more onsite track space than the system using a loop track and also requires a larger storage yard. While this method is more efficient for stations handling metallurgical coals wherein there are many coal grades, it generally entails more expensive development than for a terminal designed to handle the same quantity of a single grade.

When the ship arrives and is ready for loading, material is reclaimed from the storage pile, carried to shipside, and loaded in a manner similar to that used in the terminal without ground storage. The advantages of the ground storage terminal are that the shiploading and material production and delivery transport are independent.

The above descriptions define the basic principles which apply to the two primary types of coal export ports. Many variations of detail can be found around the world.

B. General Capital and Operating Cost Considerations

The coal export port is only one element in the transport system which transfers the coal from the mine to the overseas user. It is important to base facilities investment decisions on criteria which encompass consideration of all relevant elements in the total benefit/cost package. For instance, it may be warranted to invest in more equipment at the terminal in order to decrease ship waiting time and rail car retention time.

Cost elements in the export coal market include, in addition to the price of the material, transport costs to the port, operating and capital amortization at the terminal, and shipping and delivery costs. Excessive retention of the railcars at the port can increase total transportation cost. Savings can be made by using larger ships. However, this requires greater water depths. Increasing shiploading rates results in lower shipping costs but requires a greater investment in equipment. Developing alternative schemes, which will achieve the objectives of the system, and comparing these schemes to achieve the optimum benefit/cost ratio will identify the best development and investment strategy.

A number of factors influence the capital and operating costs of the export terminal system. These are:

- System Capacity
- System Configuration
- Storage Capacity
- Berth Occupancy

These factors are subject to wide variation. Some, for a particular site, may be dictated. Some may be varied at the option of the designer. All will influence the design of the terminal. These factors for a coal export terminal are discussed below and their influence on cost described.

System Capacity

The materials handling capacity of the export terminal must be established to satisfy the planned annual throughput of the facility. However, this factor alone seldom controls the design. For example, the system must ordinarily be designed for its instantaneous requirements, since the railcar unloading system capacity is usually based upon considerations of demurrage for railcar retention. The capacity of the outloading system, comprised of reclaimers, shiploaders and associated connecting conveyors, is based on the economics of shipping demurrage costs and the interrelationship of system costs and the number of berths provided. The final selection of equipment and its established capacity comes as a result of a detailed comparison of alternatives.

System Configuration

System configuration and layout is controlled by the method of product delivery, the shape of the property available, the need to segregate the various products into discrete, recoverable piles, and the restrictions, if any, imposed by the ship berth orientation. All of these elements are analyzed and the various solutions compared to achieve an economic optimum.

Storage Capacity

Storage capacity is dictated by the expected relationship between delivery and discharge rates. The primary objective of ground storage is to allow separation of the inbound and outbound movements of coal to and from the terminal. In addition, storage capacity is a consideration of the number of grades of coal to be stored separately at the terminal and the requirements for mixing or blending.

Berth Occupancy

Berth occupancy is a critical consideration. Depending upon the designated throughput requirement, more than one ship's berth may be required. If the annual throughput of a terminal is loaded out over a single ship berth which is working 90 percent of the time, low terminal operating costs are realized, but high ship demurrage costs result. This greatly increases the delivered cost of the coal. As a rule of thumb, a berth capacity corresponding to a range of occupancy between 60 and 70 percent results in the lowest overall cost of the commodity.

C. Capital Costs of Terminal Development

The actual capital cost of a specific coal export terminal will vary substantially depending upon the specific site, its characterisitcs and configuration and the factors discussed above. As a general "rule of thumb", according to available literature on the topic, capital costs for a modern high capacity coal terminal vary from $7 to $12 per ton of annual throughput capacity. Such items as land acquisition cost, the terminal facilities constructed, engineering, construction management, interest during construction, and legal fees are included in this estimate range. Such items as off-site improvements (railroad, water, sewer, electric service, etc.), taxes and escalation are not included.

Care should be used in applying rules of thumb because experience has shown that some facilities can be constructed for less, due to favorable physical conditions of the site. Also, adverse physical Site configurations or soil conditions can make the cost of a facility exceed the norm.

A percentage breakdown of the major capital cost components of a high capacity coal terminal is presented below:

- General facilities - site preparation, buildings, utilities, roads, drainage, coal yard air and water environmental controls, and electrical transmission lines..............................15%
- Coal unloading and stacking - rail car positioners and dumpers, stackers, conveyors, inbound coal weighing and sampling...........................25%
- Coal reclaiming and shiploading - coal reclaimers, conveyors, metering or surge bins, shiploaders, and outbound weighing and sampling................40%
- Marine facilities - trestle, pier, fendering, dolphins, moorings, and dredging............................10%
- Control systems - instrumentation control panels, computers, inventory and management reporting systems...........3%
- Railroad facilities - on-site tracks, ballast, turnouts, switches, signals, etc.................................7%

D. Operating Costs

Two primary factors affect the operating cost of an export terminal. One is the costs of labor and services which prevail in the local area. Of more importance, however, are the service requirements of the terminal. An example of the impact of service requirements on operating cost is the necessity for a high capacity coal terminal to unload a unit coal train within stringent tariff requirements, usually four hours. In order to fulfill these requirements, it may be necessary to staff and operate the rail receiving and storage facility around the clock, even though it may be used only four or eight hours per day. At lower annual throughputs, (three million tons or less), this service requirement can significantly increase the terminal per ton operating cost.

Once the operating base has been established, a terminal can accommodate additional tonnage with small increases in total operating cost, which could result in a decrease in the per ton operating cost. In general, according to available literature on the subject, operating costs for a new export terminal range from $.80 to $1.50 per ton. (This range does not include capital amortization or ownership costs). A typical distribution for these costs is discussed below:

- Labor and burden - cost of administrative and direct labor, employment cost, and fringe benefits..........................50%
- Supply cost - Utility service, maintenance and operating supplies...................20%
- Insurance and taxes - Property and liability insurance, state and local taxes (does not include federal income tax)...............20%
- Miscellaneous items - legal, accounting, telephone, travel, sales, equipment rental, etc....................................10%

E. Time Required for Development

In order to develop a coal export terminal time must be expended for facility design, permit approval, site preparation, and fabrication and erection of major equipment components. Major factors which can extend the typical schedule include environmental concerns, complex system design requirements and difficult site conditions.

In general, the development time for the type of facility currently being proposed for the west coast would range from two and one-half to five years. The sequence of major events and the time range for each is listed below:

Conceptual engineering	1 - 6	months
Acquisition of environmental permits	6 - 18	months
Detail engineering and procurement	9 - 12	months*
Construction of terminal	18 - 30	months
	30 - 60	months*

The above breakdown reflects simultaneous activities, to the extent possible, in order to minimize the total overall schedule. Time required for steps two and three could be further condensed by developers willing to expend funds on detail engineering prior to completion of the permit process. Such a decision must depend upon one's evaluation of the likelihood of eventual permit success.

*Procurement can overlap construction by 4 to 6 months.

F. Investment Potential

Although critical to the movement of coal from mine to market, the cost for using the export terminal represents only a small portion of the total transportation costs. Thus, the terminal has relatively little economic power in the total system. Rather than attempting to lead, it must respond to the economics of the other elements, including user needs and inbound rail and outbound vessel movement.

Obviously, it is desirable to develop the terminal at the point which minimizes total transportation cost given the coal origin and the ultimate user. Given the number of potential origin/destination combinations, this point is not easily located, especially when one must also speculate on the likelihood of timely permit approval. Moreover, even when all factors are considered prior to siting the export terminal, the potential profitability of its location is still susceptible to competitive rate-cutting which may occur in the inland or ocean segment of the coal movement.

Once a location has been selected, the terminal should be designed to satisfy the users' required rail unloading rates, amount and type of storage, and shiploading rates. This must be done while keeping the facility's high capital costs at a minimum.

As a result of these economic characteristics, i.e., high capital cost requirements plus sensitivity to transportation costs which can be out of the terminal's control, the development of a coal export terminal is a highly risky venture. To mitigate these economic risks, several west coast coal terminal developers have indicated that they are seeking minimum throughput commitments from prospective users prior to proceeding with construction.

G. General Environmental Considerations of Coal Terminals

Coal terminals have the potential to affect air and water quality and to increase ambient noise levels. Appropriate environmental control systems and careful design of the facilities themselves, however, can minimize their environmental impact. In the following discussion, potential air, water, and noise pollutants from a typical coal terminal will be described, along with measures which can be taken to minimize their impact. The descriptions are generic in nature and do not refer to any specific existing or planned facility.

1. Air Quality

Coal dust represents the main impact of a terminal on air quality. Dust is emitted because of the aeration of the coal stream during handling operations and because of the effects of winds on the surface of coal in storage piles.

Activities of the terminal that generate the most airborne particulate matter are:

- Rail Car Dumping
- Coal Transfer from Belt to Belt
- Belt Conveying
- Coal Stacking
- Coal Reclaiming
- Ship and Barge Loading
- Coal Storage Piles
- Mobile Equipment Operations

Dust emissions can be reduced significantly, however, by the installation of control devices.

Control devices work either by reducing the level of emissions generated by an operation and/or by trapping the dust that is generated. Most facilities planned in the U.S. combine various measures so that fugitive dust is only 5-10% of emissions without controls. With the application of control devices, coal handling facilities can meet federal air quality standards, as shown by the procurement of permits for several proposed terminals in the eastern United States.

Dust emissions can be minimized using the following techniques:

1. sound overall design of the facility (dust prevention)
2. sprays (dust suppression)
3. enclosures, guards, hoods, and windbreaks (dust containment)
4. dust collectors (dust removal)
5. equipment washdown (dust removal)
6. sound operating practice and maintenance (dust prevention)
7. paving of roads and open areas (dust prevention)

Good overall design. While most of the techniques listed above can be considered part of the design of a coal terminal, some design options deserve special mention. First, mobile equipment activity on and around storage piles generates significant amounts of dust. The greater the proportion of coal storage that is recoverable by rail-mounted reclaimers, the less bulldozer and mobile equipment activity is required for pile grooming. Therefore, a terminal designed with 100% "live" piles, i.e., piles entirely accessible to reclaimers, requires mobile equipment only for clean-up activities. Thus, a significant source of dust is eliminated.

Conveyors, transfers, and other structures should be designed with sufficient ground clearance to enable access for cleaning up spills and washing down areas and structures.

The distance that material falls can be reduced by the installation of travelling, luffing, and slewing stackers and shiploaders with telescopic booms. These machines can follow the contour of the piles onto which they are loading, thus reducing the distance that the material falls. A shorter fall distance reduces the dust generated. Chute designs for conveyor transfers are important. Effective designs minimize material drop and agitation.

Sprays. Sprays are used to keep the surface of the coal moist. A higher moisture content decreases the dust emitted. In addition, sprays can trap dust particles. Experience has shown that when coal is kept moist during handling and stockpiling, dust emissions can be reduced to manageable, acceptable levels.

Sprays can be mounted at various locations, and they can be part of stationary or mobile systems. Sprays are generally provided at all transfers, bins, storage piles, dumpers, and shiploaders. In addition, unpaved roads are sprayed periodically.

Sprays can be activated manually or automatically. Those near conveyors can be activated by the movement of the loaded belt. Area sprays surrounding ground storage primarily replenish evaporative losses and maintain the moisture content of the pile surface. These sprays can be controlled by mini-computers which take into account wind speed and direction, temperature, humidity, cloud cover, and characteristics of the coal. These automated systems can be modified on the basis of operating experience, and they incorporate a manual override capability.

Sprays are also used to apply dust-suppressing chemicals. One class of chemicals is wetting agents. Typical wetting agents are nonionic detergents, comparable to those used daily in millions of homes for washing dishes. Water by itself has a relatively high surface tension which keeps dust particles on the exterior surface of spray droplets. By adding a wetting agent, the surface tension of the water is reduced, allowing the dust particles to be completely wetted. Because of the affinity the wetted dust particles have for each other, they form larger particles which are unable to remain airborne. Systems using wetting agents are more effective than those using water alone.

A second class of compounds applied by sprays is crusting agents. A crusting agent sprayed over a pile surface causes a solid crust to be formed which will normally last from several months to a year. This crust prevents dust from blowing off the pile. A disadvantage of this system is that disturbed areas must be restored by re-spraying.

Enclosures, guards, hoods, and windbreaks. Mechanical barriers can be used to trap dust emitted from handling operations. For example, transfer points can be enclosed by surrounding chutes with barriers or by erecting transfer houses to contain the dust. Shiploaders and stackers can be equipped with telescoping chutes which adjust to the level of the coal pile, preventing the escape of dust.

Enclosures can also be placed around conveyors, except in cases where the capability of loading or discharging along the length of the conveyor is desired. Wind guards can be installed when enclosures would interfere with travelling stacker or reclaimer operations.

Windbreaks, berms, and screens can be used to reduce wind velocities in certain areas, thus reducing the amount of airborne dust. For example, long-term storage piles can be placed around the periphery of the active storage and treated with a crusting agent. The material will then function as a windbreak for the active storage. Trees can be planted around the edge of the terminal to act as a windbreak, visual screen, noise barrier, and runoff containment.

Dust collectors. When handling operations occur in enclosed areas such as chutes, spouts, or bins, dust can be drawn away by fans and propelled through dust filters, bag houses, or cyclones (another type of dust collector). Shiploaders, transfer houses, car dumpers, and bin enclosures have been equipped with ventilation systems that include dust collectors, when the application of moisture is not advisable. Filter type collectors are ill-suited for areas of high humidity, where they tend to clog.

Washdown. Equipment, such as empty delivery trucks, can be hosed down with a high pressure water spray to remove dust. Conveyor galleries, floors of transfer stations, and roads can be washed periodically. Belts should be washed, but they can also be equipped with scrapers and dribble pans that remove and collect material that sticks to the belts.

Operating practice and maintenance. Proper equipment operation and maintenance is required if the pollution control features are to function efficiently. Examples include the following:

- prompt clean-up of spills from conveyors or transfers
- maintenance of clean roads using mobile cleansing units
- use of mobile equipment with rubber tires, rather than tracks, for pile grooming operations
- maintenance of clam shell bucket lip seals and teeth, conveying equipment, skirt boards, and dust control apparatus
- conduct of scheduled maintenance of control devices during periods when high winds are not expected

Paving roads and open areas. While most of the dust emitted from a terminal is derived from coal, soil particles can be picked up by the wind from gravel or dirt roads and other open areas. As an alternative to spraying, these areas can be paved.

2. Marine Life

The effects of coal particles on aquatic biota is a subject of active research. Results to date are contradictory, but investigations show that the effects on water quality and marine life stem from the following processes:

1. increase in turbidity
2. increase in sedimentation rates
3. changes in the acidity of the receiving water body
4. release of the chemical constituents of the coal

The magnitude of the effect from these processes varies in response to numerous factors, such as the amount of dust deposited, currents and flushing rates of the receiving water body, existing water and sediment quality, species composition, and so on.

Dust control techniques usually minimize the environmental impact on receiving water bodies by reducing the amounts of dust emitted and thereby deposited in adjacent water bodies.

Turbidity. Increased turbidity may lower the overall biological productivity in a waterway by decreasing light penetration. This lowers the suitability of the area for aquatic vegetation because of a decrease in photosynthetic activity. Turbidity may also cause the temporary emigration of mobile aquatic species, contribute to the displacement of benthic organisms by clogging respiratory and feeding surfaces, and modify the chemical equilibrium at the sediment - water interface.

In an active harbor area or in coastal areas with wave, wind, and current action, it is expected that natural flushing action would minimize increases in turbidity.

Sedimentation. Accumulations of coal dust on the harbor bottom will alter the composition of benthic fauna. Spawning and feeding grounds may be covered, and trace elements could accumulate locally in the sediments. The effects of coal on the harbor bottom could include a reduction in species diversity and dominance by tolerant organisms. Many harbor bottoms, however, already support modified biological communities because of existing shipping operations. Thus, the incremental effect of a well-designed coal terminal may not be significant. Moreover, the effects decrease as the distance from the terminal increases.

Changes in acidity. Slight changes in the acidity of a waterway may occur locally due to increased coal dust. While eastern U.S. coal has a relatively high sulfur content and may increase the acidity of the water slightly, western U.S. coal has a carbonate base and may decrease the acidity of the water slightly. It is generally believed that raw coal in a waterway will not influence the pH significantly because of the dilution and buffering provided by the receiving waters.

Release of chemicals. Coal absorbs organic pollutants to some degree, acting like activated carbons used in treating waste water. However, depending on the hardness of the water, the rank (stage of metamorphosis) of the coal, and the coal seam and basin, small amounts of elements and minerals such as aluminum and boron, may be released to a waterway. These elements are not considered extremely toxic or dangerous in water at low concentrations and hence should not present a significant problem.

In summary, the effects of coal dust on waterways are still being investigated, and some contradictory reports should be expected. The impact, however, appears to relate to the quantities of dust deposited and the type of coal involved. For the most part the impact appears to be localized and is reduced through the use of control devices necessary to meet air quality standards. The marine environment in most ports is usually highly affected by existing shipping operations, so the incremental effect from a coal terminal can be minimal, depending on what other activities are occurring at the port.

3. Water Quality

The drainage, treatment, and re-use of rainwater falling on a coal terminal must be carefully analyzed. As water percolates through coal it can dissolve various elements and minerals. Many techniques are in use for treating and recycling the stormwater runoff to minimize the effects on the groundwater and the receiving water body.

Coal leachate has been analyzed many times, producing evidence of its highly variable chemical composition. Factors which affect the constitution of the leachate include:

- the concentration of pyrite and marcasite ($Fe\ S_2$) in the coal
- the configuration and area of the storage pile
- the amount of preparation and cleaning which the coal has received
- particle size of the material
- local meteorological conditions
- the concentration of calcium carbonate ($Ca\ CO_3$) or other neutralizing substances in the coal
- the concentration of trace metals in the coal
- the residence time of material in the pile

The chemical processes that form leachate are believed to stem from the oxidation of pyrite. This chemical reaction produces an environment in which the minerals in coal are more easily dissolved. The minerals which are extracted vary with the coal, but can include iron, aluminum, calcium, manganese, nickel, cobalt, chromium, copper, zinc, and cadmium.

Water which has passed through storage piles, and water derived from equipment and gallery washdowns, should be collected and pumped to properly-sized retention basins for treatment. Chemicals are added to the retention basins to aid in the sedimentation of particles and contaminants and to restore the appropriate acidity to the water. Some portion of the treated water is often recycled to the sprays to be used in dust suppression. If excess water remains, it is discharged off-site after appropriate treatment.

Some facilities are now being designed with runoff treatment systems that are sized so that off-site discharge is necessary only during unusually severe storms. During normal conditions, the runoff is entirely utilized by the spray system for dust suppression.

Sanitary waste is another pollutant which emanates from a terminal. Provision is usually made for on-site septic systems or hook-ups to local sewage collection systems. Where conditions warrant, a small package treatment facility can be installed on site and the treated effluent may be discharged to a nearby water body or to a municipal sewerage system.

4. Noise Emissions

Most of the machinery and operations at a coal terminal produce noise. Sources include:

- mobile equipment (trucks, bulldozers, front-end loaders)
- rail cars and trains
- ships
- conveyors

- stackers
- loaders
- reclaimers
- feeders

Data on the sound characteristics of these machines show that the sound pressure and tonal qualities produced by the machines vary, and overall sound levels vary with the operations that are occurring at the terminal at a particular point in time. Moreover, many factors affect the attenuation of the sound. The perception of the sound by recipient populations also varies with the time of day, level of background sound, individual sensitivities, and the sound pressure and tonal composition.

Many methods are used to design facilities that will be in compliance with the relevant noise standards. Examples are:

- to site the facility away from noise-sensitive populations
- to establish the noisiest operations away from the periphery of the site
- to provide a buffer zone around the site
- to use accoustical barriers, such as vegetation, screens, and berms
- to schedule rail and truck operations during daytime hours
- to use mufflers on all mobile equipment and trains
- to use continuous welded track and track lubricators
- to use enclosures to muffle sound, such as buildings around car dumpers
- to purchase equipment that has been designed to function more quietly.

These methods can be combined to significantly reduce the sound emitting from a coal terminal.

5. Other Considerations

The previous discussion deals with environmental considerations that pertain specifically to coal terminals. Other considerations, such as the possibility of archaeological remains on-site, degradation of valuable biological habitats, or aesthetic degradation in residential areas, apply generally to large-scale industrial development. Judicious site-selection is the best means of minimizing the problems.

Chapter 3

EXISTING WESTERN EXPORT CAPABILITY

A. Introduction

Chapter 3 describes the existing west coast bulk facilities which are currently loading export coal or, in the case of the Port of Stockton, immediately ready and able to handle coal. Facilities now in operation are located at Long Beach and Los Angeles, California, and Vancouver, British Columbia. The expansion of these terminals and Canadian plans for new west coast development are also discussed. Plans and sites for potential new U.S. development are addressed in Chapter 4. Aerial photos of the three existing U.S. sites are also included in Chapter 4.

B. United States

Throughput capacity on the West Coast of the United States at present totals about 5 million tons at the two operating facilities. Profiles of each port follow.

1. Port of Long Beach Coal Handling Terminal

Location	Pier G, Long Beach, California
Owner	Port of Long Beach
Operator	Metropolitan Stevedore Company
Origin of Coal	Predominantly Utah. Also Colorado and New Mexico.
Rail Delivery	Union Pacific and Santa Fe (84 car unit trains)
Dumping	1 rotary and 2 bottom dumps; effective rate 25 cars per hour (four hours per train)
Storage	80,000 metric tons capacity
Reclaiming	Gravity drawdown reclaiming, assisted by bulldozer; 54 inch conveyors
Shiploading	Average 2400 tons per hour (TPH); design rate 4000 TPH. Shiploader conveyor, 60 inches
Throughput Capacity	3 million tons per year
Depth Alongside	38-45 feet draft Mean Lower Low Water
Channel Depth	60 feet
Maximum Vessel Size	70,000 deadweight tons (DWT) (2 berths available); 100 foot beam
Loading Charge	Direct rail to ship $4.73/long ton. Rail to storage to ship $6.00/long ton, according to published rates.

Expansion Plans	Increase stated annual throughput capacity to five million tons by the following actions: ● Install second shiploader (5000 TPH) ● Widen and accelerate conveyors ● Increase storage capacity to 200,000 tons ● Add rail trackage and direct car to vessel capability ● Dredge alongside to accommodate 50 foot draft at MLLW. See also discussion of new Long Beach terminal plans.
Schedule	The above work is now underway and has already increased terminal capacity. The full additional capacity will be available by late 1982.
Estimated Cost	$10,000,000 plus

2. Port of Los Angeles Coal Handling Terminal

Location	Berths 49-50, San Pedro, California
Owner	Port of Los Angeles
Operator	American Bulk Loading Enterprises, Inc.
Origin of Coal	Predominantly Utah. Also Colorado and New Mexico.
Rail Delivery	Union Pacific (80-84 car unit trains); Santa Fe (up to 90 car unit train)
Dumping	1 rotary dumper; average rate 14 cars per hour (six hours per train)
Storage	14 acres; 170,000 metric tons capacity
Reclaiming	Bucketwheel, 850 tons per hour
Shiploading	15,000 to 20,000 tons per day (two shifts)
Throughput Capacity	3+ million tons per year
Depth Alongside	51 feet
Channel Depth	51 feet
Maximum Vessel Size	100,000 DWT
Loading Charge	Direct rail to ship $4.60/long ton. Rail to storage to ship $6.05/long ton, according to published rates.
Expansion Plans	Although expenditure commitments for expansion are not finalized, the port indicates that it is in

Expansion Plans (cont'd.)	the planning stages to improve the facility. Improvements would include an additional 100,000 tons of ground storage, additional rail trackage and installation of an independent stacker which would permit simultaneous rail car unloading and stockpiling while reclaiming and shiploading. Total throughput capacity as a result of these improvements is estimated to be 5 million + tons per year. See also discussion of new Los Angeles terminal plans.
Schedule	The above work is scheduled for completion by 1984.

3. Port of Stockton Coal Terminal

Location	Port of Stockton
Owner/Operator	Port of Stockton
Rail Delivery	Southern Pacific, Western Pacific: 80-84 car unit trains
Dumping	Effective rate: 24 hours per train
Storage	100,000 short tons
Shiploading	Average: 500 short tons per hour Maximum: 800 short tons per hour
Operation	24 hours per day, 7 days a week
Channel Depth	30 feet
Maximum Vessel Size	Draft of 31'6" or 32' at discretion of vessel Master. Can load 20,000-30,000 short tons depending upon vessel configuration. Best size approximately 24,000 tons.
Loading Charge	Rail to storage to ship $5.75/short ton, according to published rates.
Expansion Plans	See discussion of new Stockton terminal plans.

C. Canada

1. Vancouver Area

Coal shipments through Vancouver, which totaled 15 million long tons in 1980, are expected to increase to 28 million tons by 1985 and to 42 million tons in 1990. The three coal export terminals -- Pacific Coast, Neptune and Roberts Bank -- currently have combined annual throughput capacity of approximately 20 million tons.

The National Harbours Board has announced a quadrupling in site area of Roberts Bank by dredging up 15.3 million cubic yards of sand to increase the area of the terminal from 50 to 200 acres. Current tenant, Westshore Terminals Ltd., a subsidiary of British Columbia Coal Ltd., will double its leased property to expand throughput potential from 11 million tons per year in 1981 to 22 million tons by 1985. The remaining 100 acres should also be ready to lease by 1985, but the extent to which this portion will be used for coal is unclear.

The two coal terminals within Vancouver's inner harbor, Neptune Bulk Terminals Ltd. and Pacific Coast Terminals Ltd., are not expected to expand. Layout difficulties prevent Neptune from handling any more or larger unit trains, but it should retain its current throughput, as it is owned in part by two Alberta mines. Pacific Coast Terminals is a multi-purpose bulk facility which also loads Alberta coal but could lose this traffic upon completion of the Roberts Bank expansion. Characteristics of all three Vancouver facilities are listed in Figure 3.1.

2. Northern British Columbia

Coal exports from northeast British Columbia are planned to be handled by a new terminal at Ridley Island, Prince Rupert, with an initial capacity of approximately eight million tons. The timing of development remains uncertain although export contracts have reportedly been signed which would require operating capability to be in place within five years. The proposed Ridley Island facility is to accommodate vessels in excess of 200,000 DWT.

Figure 3.1

MAJOR CANADIAN COAL LOADING TERMINALS

(existing & planned)

PORT/TERMINAL	CHANNEL DEPTH (METERS) EXISTING	CHANNEL DEPTH (METERS) PROPOSED	VESSEL DWT* (1000) EXISTING	VESSEL DWT* (1000) PROPOSED	CAPACITY (MTPY)** EXISTING	CAPACITY (MTPY)** EXPANSION UNDERWAY	CAPACITY (MTPY)** EXPANSION PLANNED***	ESTIMATED TOTAL CAPACITY BY 1985
Vancouver - Roberts Bank	19.8		150	200+	11.0	11.0	7.7	22.0
Vancouver - Neptune B. T.	15.2		90		6.6	Multi-purpose bulk		6.6
Vancouver - Pacific B.T.	13.7		65		2.2	Multi-purpose bulk		2.2
Prince Rupert (Ridley Island)		21.3		200+			7.7	
TOTAL (EFFECTIVE)					19.8	11.0	15.4	30.8

*DWT = Deadweight Ton.

**MTPY = Million Tons Per Year.

***Completed after 1985.

Chapter 4

POTENTIAL NEW SITES

A. Introduction

There are a number of potential sites on the U.S. Pacific Coast for development of new coal export terminals. Each has a separate set of characteristics which must be considered as a whole in determining its relative merits. Examples include water depth, rail service, land availability and environmental constraints.

To gather first-hand information on these characteristics and to ascertain local interest, inquiries were sent to 35 public ports and private property owners on the west coast. (A copy of the questionnaire is included as Appendix G.) Twenty-six recipients responded that they are actively pursuing or interested in the export coal market. These positive responses group generally into six geographic regions as outlined in Figure 4.1 and depicted in Figure 4.2.

Recipients who indicated that they do not intend to pursue development at this time include ports or property owners at Alameda, Oakland, and Eureka, California; Seattle and Olympia, Washington; and Anchorage, Alaska. San Diego, California; St. Helens, Oregon; and Steilacoom (Kaiser Cement), Washington did not respond.

In this chapter, the 26 individual responses are summarized relative to available potential sites. The level of detail provided by the respondents varied, reflecting their differing stages of planning

Figure 4.1

West Coast Sites Under Consideration
For Coal Terminal Development

California

South Coast
1. Long Beach
2. Los Angeles
3. Port Hueneme

San Francisco Bay/Rivers
4. San Francisco
5. Redwood City
6. Richmond
7. Selby
8. Benicia
9. Sacramento
10. Stockton

Oregon/Washington

Northwest Coast
11. Coos Bay, OR
12. Grays Harbor, WA

Columbia River
13. Warrenton, OR
14. Astoria, OR
15. Portland, OR
16. Vancouver, WA
17. Kalama, WA
18. Longview, WA

Puget Sound, WA
19. Bellingham
20. Anacortes
21. Tulalip
22. Everett
23. Tacoma
24. West Tacoma
25. Dupont

Alaska

26. Seward

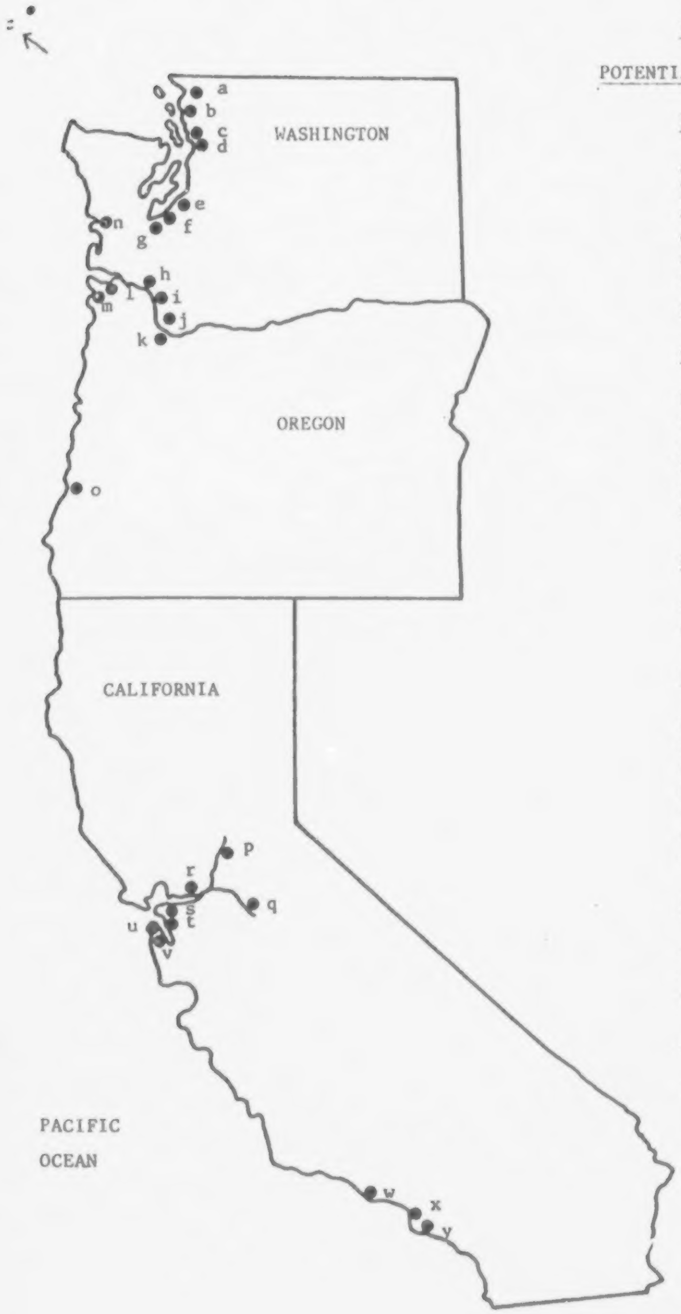


Figure 4.2

POTENTIAL TERMINAL SITES

PUGET SOUND

a. Bellingham
b. Anacortes
c. Tulalip
d. Everett
e. Tacoma
f. West Tacoma
g. Dupont

COLUMBIA RIVER

h. Longview
i. Kalama
j. Vancouver
k. Portland
l. Astoria
m. Warrenton

NORTHWEST COAST

n. Grays Harbor
o. Coos Bay

BAY/RIVERS

p. Sacramento
q. Stockton
r. Benicia
s. Selby
t. Richmond
u. San Francisco
v. Redwood City

SOUTH COAST

w. Port Hueneme
x. Los Angeles
y. Long Beach

ALASKA

z. Seward

and investigation. All data and judgments, however, are those of the ports except that Corps of Engineers comments have been added on the status of dredging projects. The editors have, without evaluation, merely consolidated the submittals into a consistent format. Therefore, interested parties should be prepared to confirm on their own the reported data, particularly in two areas: The first includes (1) environmental/permit issues, which most ports discounted as presenting no problems, and (2) vessel size, which is discussed below.

B. Vessel Size Accommodated

1. Considerations

Although the port descriptions are presented as received, factors affecting reported vessel size capacity should be understood before examining the site summaries. Two factors influence vessel accommodation. First, maximum vessel size in a given waterway is dependent on operational considerations. For example, the Corps of Engineers ordinarily assumes an under-keel clearance of five feet, but some shipmasters will accept a lesser margin in certain channels. Crossing the bar at river mouths requires greater depths. Figure 4.3 lists the existing authorized and maintained channel depths of West Coast ports. (It should be noted, however, that some ports have channels naturally deeper than authorized by the Corps of Engineers.)

The second factor is ship design. Typical dimensions of various size bulk carriers are presented in the Ocean Transportation chapter of this report, along with a discussion of design options, such as wide body/shallow draft configurations.

In describing individual port capabilities, some respondents assume shallow draft designs. Others rely on the added water depth available at flood tides or on the margin provided by the practice of overdredging to a depth slightly greater than the authorized Corps of Engineers project. Several assume that authorized but not yet funded deepening projects will in fact occur. Therefore, actual ability of a specific vessel to call and be fully loaded at a given terminal must be evaluated on an individual basis.

Figure 4.3
SELECTED U.S. WEST COAST DEEP DRAFT PORTS

PORT	CHANNEL DEPTH (Feet)		MAINTENANCE DREDGING		
	Authorized	Maintained 1/	Frequency	Average Volume in Thousands of Cubic Yards	Average Cost Thousands of Dollars (1981 Dollars)
CALIFORNIA*					
Los Angeles	45	35-51	None	-	-
Long Beach	35	45-61	None	-	-
Port Hueneme2/	35	35	None	-	-
San Francisco3/	40	40	Annual	800	1,350
Richmond	35	35	Annual	480	1,275
Redwood4/	-	-	As required	-	-
Oakland	-	-	Annual	500	1,085
Pinole Shoal Channel	-	-	2 yr cycle	200	540
Suisun Bay Channel	-	-	Annual	185	450
San Joaquin River			As required	241	1,190
Moss Harbor	-	-			
Landing Harbor	-	-	4 yr cycle	78	479
Benicia	**	-	-	-	-
Sacramento	30	30	2 yr cycle	590	1,147
Stockton	35	30	Continuous (Included in Sacramento)		
OREGON					
Coos Bay	35	35	Annually	1,700	1,500
Columbia River & Lower Willamette	40	40	Annually	12,500	6,500
Portland	40	40	Annually (Included in Columbia R.)		
WASHINGTON					
Kalama	40	40	Annually (Included in Columbia R.)		
Vancouver	40	40	Annually	"	
Longview	40	40	Annually	"	
Grays Harbor	30	30	Annually	1,400	2,400
Bellingham	30	30	10 years	30	50
Anacortes	12	12	10 years	9	27
Everett	30	30	3 years	150	250
Tacoma	35	35	10 years	55	90

*Estimates only.

**Not a Federal project.

1/Maintained depths greater than authorized project depths results from dredging by port entity.

2/Has no maintenance requirements, however, there may be some confusion with Channel Island Harbor which is one mile north.

3/Figures only for dredging the bar channel-west of the Golden Gate. Once inside bay-too many harbors.

4/Project capability was for dredging 544,000 cubic yards with land disposal costs of $1,635,000. Lack of an adequate disposal site plus reduced funding has limited the act dredging.

Source: U.S. Army Corps of Engineers compilation.

2. Dredging Legislation

The question of ability to accommodate vessels is especially difficult given the present uncertainty over the financing in the United States of both new projects intended to increase the accessibility of ports to large ships and projects required to maintain existing shipping channels. The way in which the mounting debate is resolved will have major effects on western ports.

At present, and historically, new channel projects and maintenance dredging have been financed entirely by the federal government. Approvals of new projects, however, occurred at increasingly slow rates, to the point that, according to the American Association of Port Authorities (AAPA), there have been no authorizations of new navigation projects in the past six years.

The existing financing system remains in effect until Congress passes and the President signs new legislation, but some action appears imminent. Increasing competition for limited dredging funds, a new administration, and project approval delays have precipitated at least 13 bills in the present session of Congress to modify current practices. Three congressional subcommittees have scheduled or conducted hearings.

The bills that have been introduced vary, but almost all include some provisions to speed the issuance of approvals for new projects. The bills diverge greatly, however, in the financing systems proposed. The Administration proposal specifies 100% non-federal funding, while others would maintain the present 100% federal finance system. Most proposals range in between, including some which propose distinct funding ratios for new projects and for maintenance dredging.

Many details, such as user charges, fee schedules, mechanisms of collection, and determinations of whom to assess, remain to be worked out if local cost-sharing is enacted. The disbursement of local funds is also being debated. Some proposals include a national pool of funds, while others specify that revenues will be used only in the region where they are collected.

The Corps of Engineers declines to speculate on the outcome. Some observers, however, expect that Congress will act in this session, and that, while speeding the approval process, the changes will most likely eliminate or substantially decrease the federal financing of dredging. If the financing system is altered, the status of all authorized or approved projects is unclear until the willingness of sponsors to pay the local share is ascertained.

Others, however, expect that it will require at least one more session, perhaps several, before Congress resolves the funding issue. If a deadlock results in lengthy delay, any new dredging projects in the interim will probably be limited to those ports which either are able and willing to finance the work themselves or can line up private project sponsors.

C. New Sites

The responses for the specific development sites are summarized in this section. Each is described independently and its location is depicted on the appropriate navigation chart. These charts are for background information only, however, and may not always provide all relevant information such as rail access or land use conflicts. Photos, when provided by the port, are also included.

In cases where a property owner expressed interest in terminal development but did not identify a specific site, charts are included only to give general harbor characteristics. This applies to Port Hueneme and Richmond, California, and to Longview, Anacortes and Tulalip, Washington.

Where channel considerations in a region apply to several sites, an introductory background discussion is included. This is provided for northern California's John F. Baldwin Project as well as for the Columbia River and Puget Sound. All water depths are given at Mean Lower Low Water (MLLW).

1. Long Beach, California

Property Owner:	Upland Industries Corporation (real estate and land development subsidiary of Union Pacific Corporation)

Plans:

Staged development of terminal with ultimate capacity of 30 million tons per year. Initial stage 10 million tons per year. Vessels to 150,000 deadweight tons (DWT) to be accommodated. Feasibility study participants include Upland Industries, Port of Long Beach, Crowley Maritime Corporation, Metropolitan Stevedore Company, and C. Itoh & Company.

Schedule:

Design in progress. Construction scheduled to commence January 1983, completion December 1984.

Site Characteristics:

Size	100+ acres
Water Frontage	3,000 feet
Water Depth	channel - 60 feet existing alongside - 59 feet existing - 60 feet planned mean tidal range - 3.7 feet
Present Use:	Oil production.

Dredging:

Port to fund minor dredging alongside berth to equalize channel depth. Cost undetermined.

Rail Service:

2,000 feet to mainline. Direct service by Union Pacific. Atchison, Topeka and Santa Fe and Southern Pacific also to have access.

Environmental/Permit Issues:

- South Coast Air Quality Basin a non-attainment area relative to particulates
- Site itself not critical habitat but bordered by relatively productive harbor waters
- Traffic impacts due to rail crossings at grade
- Noise of rail traffic.

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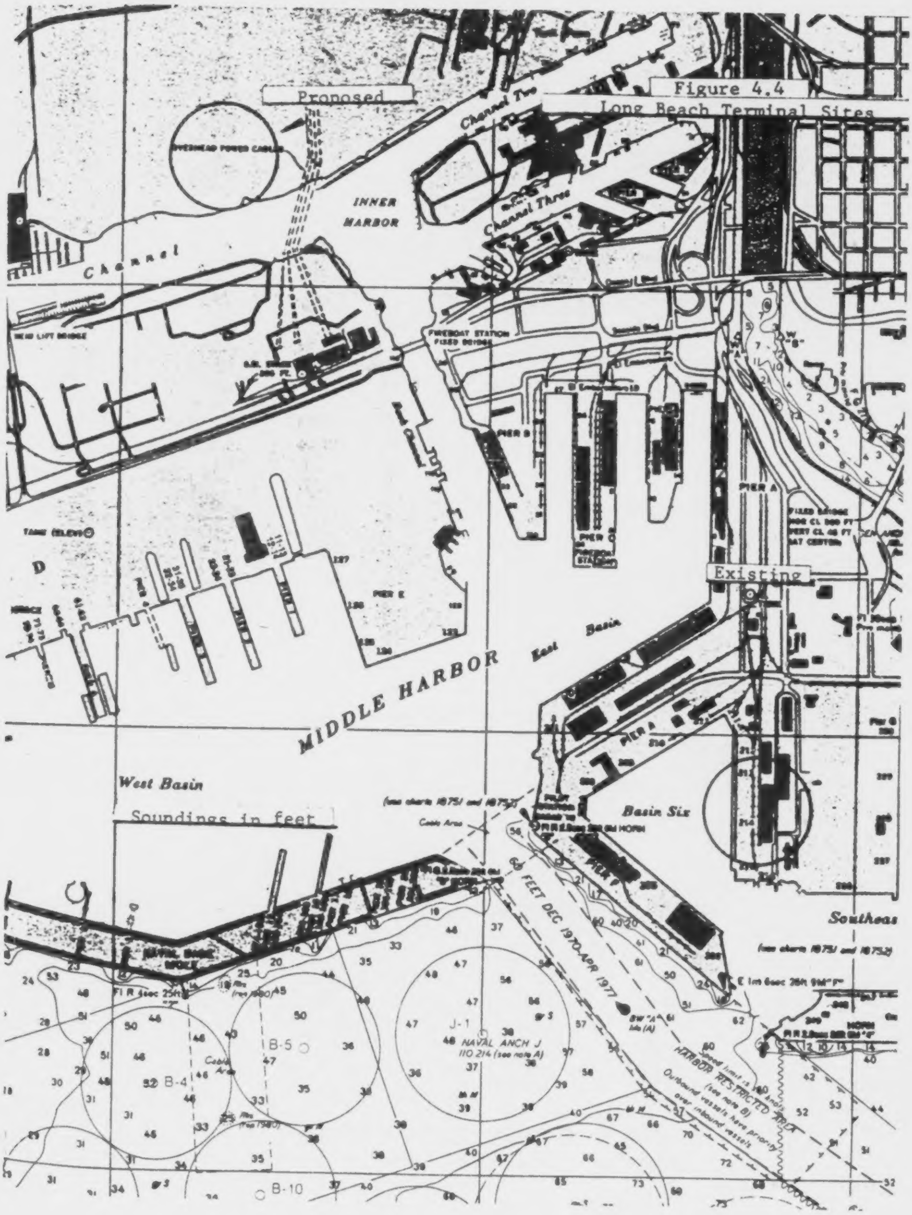

Figure 4.4 Long Beach Terminal Sites

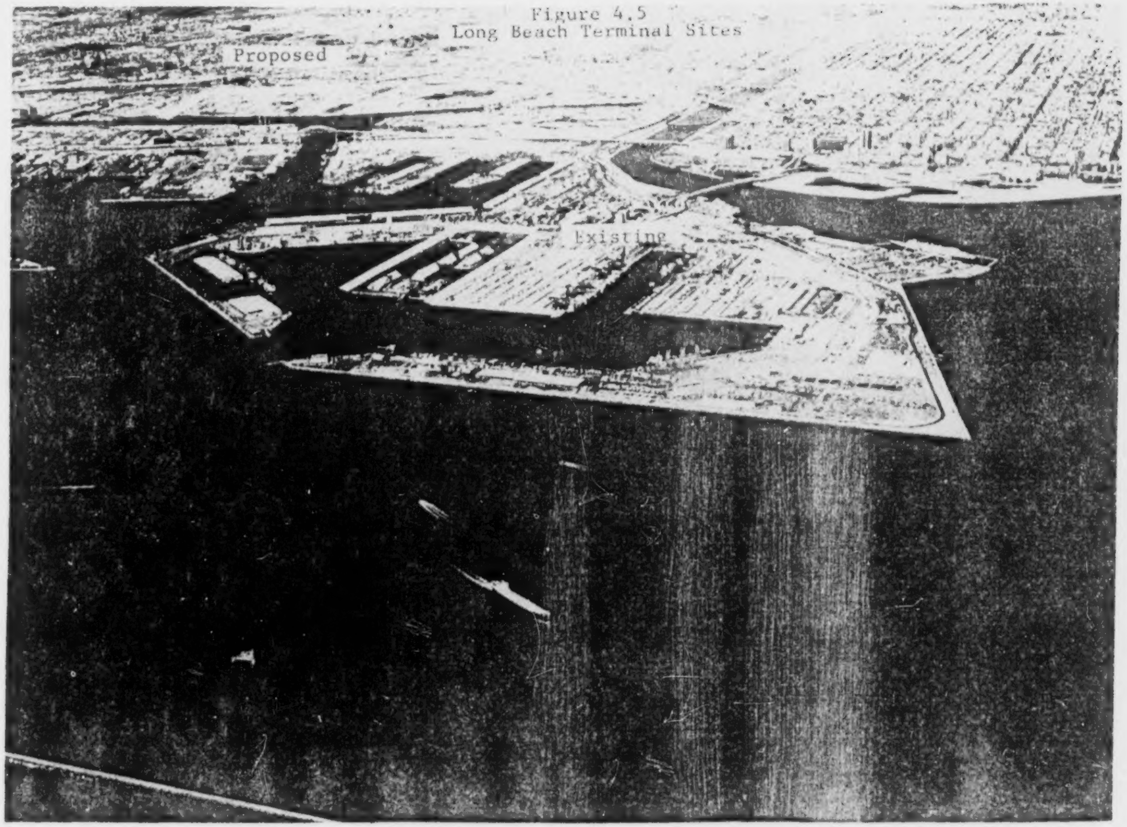

Figure 4.5
Long Beach Terminal Sites

2. Los Angeles, California

Property Owner: Port of Los Angeles

Plans:

Staged development of terminal with ultimate capacity of 20-30 million tons per year. Initial stage 10-15 million tons per year. Site is currently being created by fill resulting from dredging of main channels. New 65-foot channel from harbor entrance will be dredged to proposed site. No participants selected yet.

Schedule:

Requests for proposal to be disseminated in near future. Proposals to be received by early 1982. Scheduled completion of first phase - mid-1985; second phase - 1990.

Site Characteristics:

Size	190 acres of filled land
Water Frontage	4,000 feet
Water Depth	channel - 45 feet existing - 65 feet planned alongside - 22 feet existing - 65 feet planned mean tidal range - 3.7 feet

Present Use: Submerged land to be reclaimed.

Dredging:

Port to fund dredging of 65 foot channel from harbor entrance to proposed site. Volume estimated at 14 million + cubic yards. Disposal to be adjacent to proposed terminal site.

Rail Service:

2,700 feet to mainline. Atchison, Topeka, and Santa Fe, Southern Pacific and Union Pacific all to have access. Present single-line track and bridge both to be doubled.

Environmental/Permit Issues:

- South Coast Air Quality Basin a nonattainment area relative to particulates
- Proposed facility in close proximity to productive habitats, possible feeding area for endangered species
- Traffic impacts due to rail crossings at grade
- California Coastal Commission approval required for dredging

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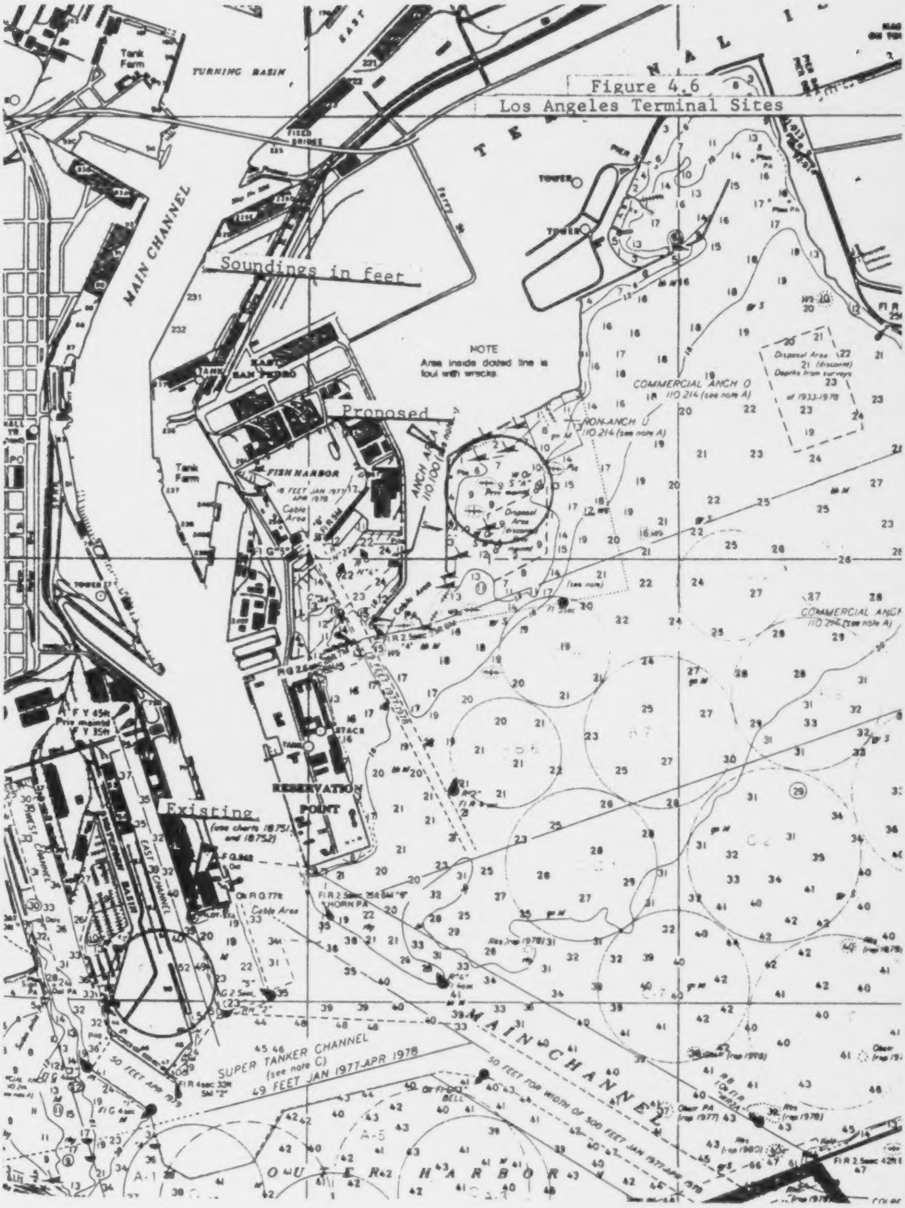

Figure 4.6
Los Angeles Terminal Sites

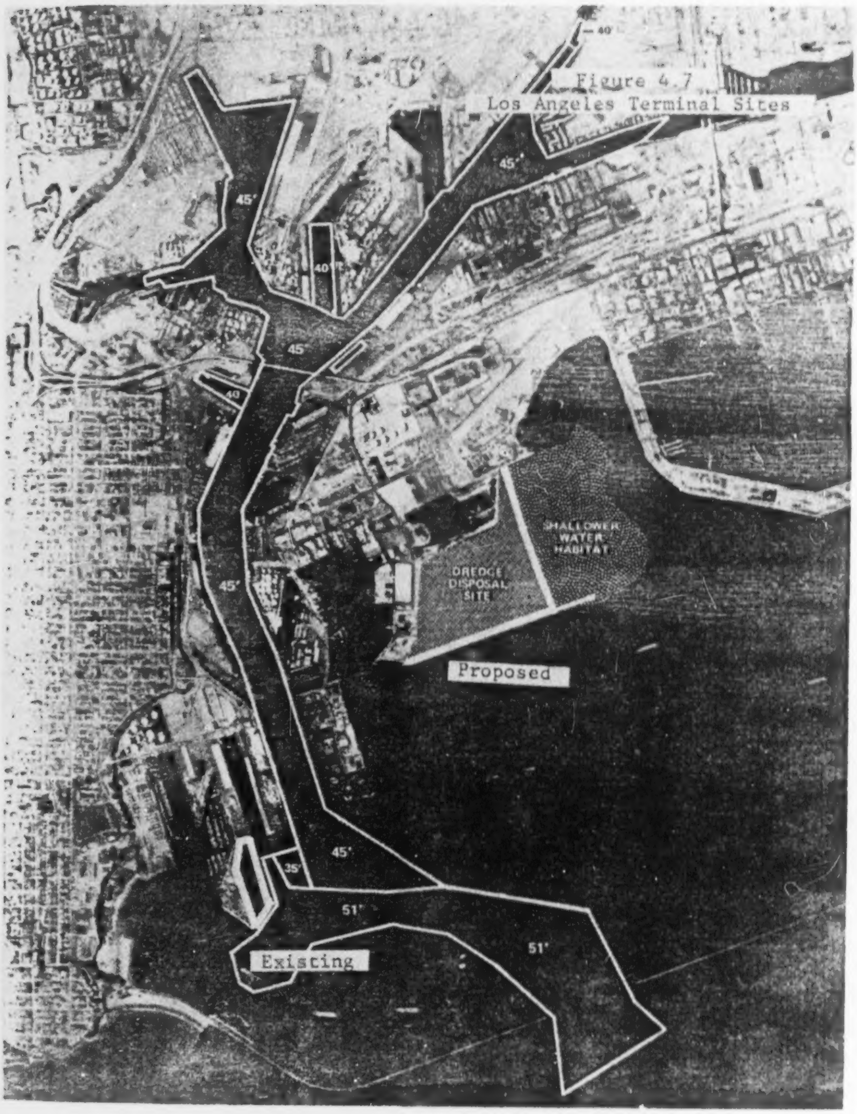

Figure 4.7
Los Angeles Terminal Sites

3. Port Hueneme, California

Property Owner: Oxnard Harbor District

Plans/Schedule: None announced.

Site Characteristics:

Size	up to 60 acres, plus additional acreage subject to Navy approval of availability
Water Frontage	preferential berth assignment only
Water Depth	channel - 35 feet existing
	alongside - 35 feet existing
	mean tidal range - 5.4 feet

Present Use: Harbor related.

Dredging: None announced.

Rail Service:

Ventura County Railroad available at wharves; connects with Southern Pacific. Large unit trains could result in restriction on hours of operation.

Environmental/Permit Issues:

- Port Master Plan completed and approved by California Coastal Commission
- No significant impacts reported

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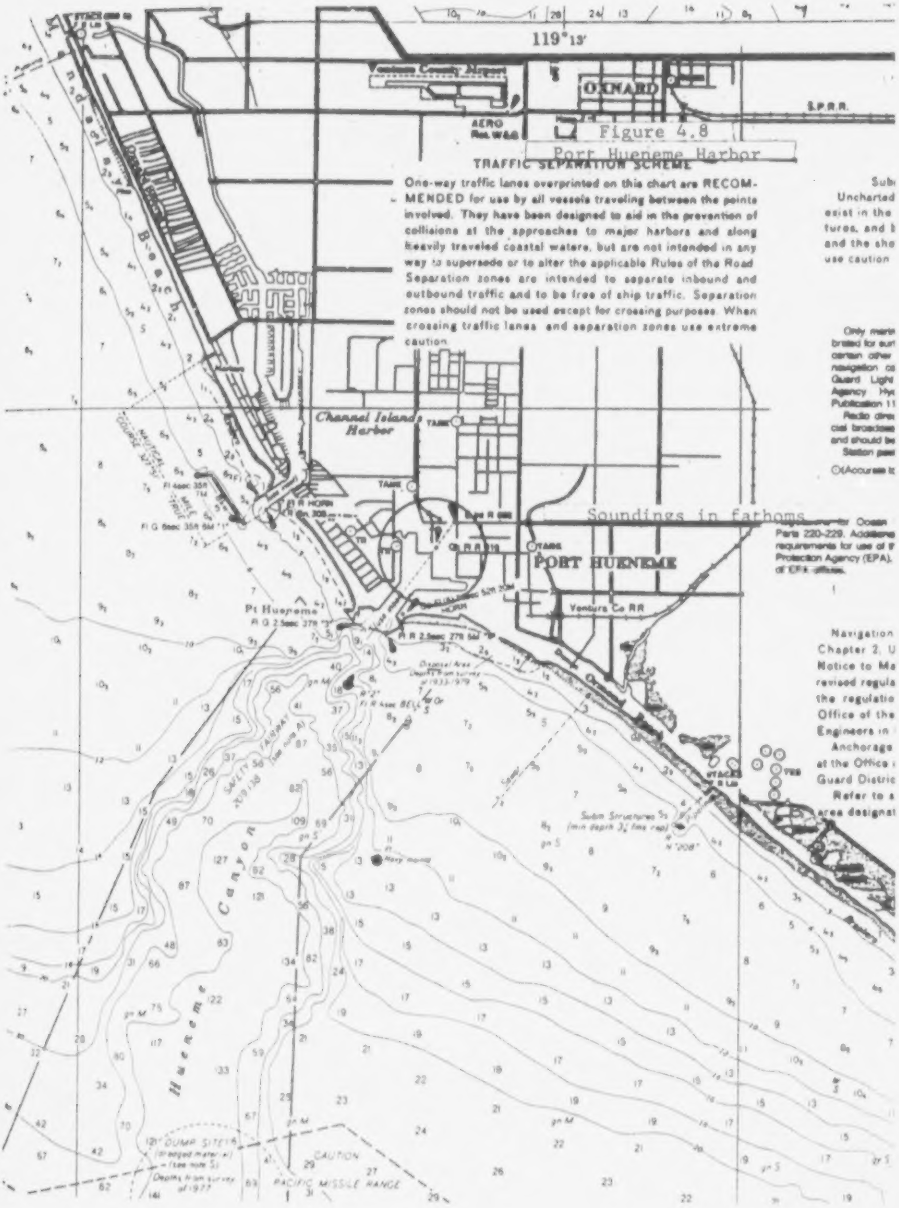


Figure 4.8

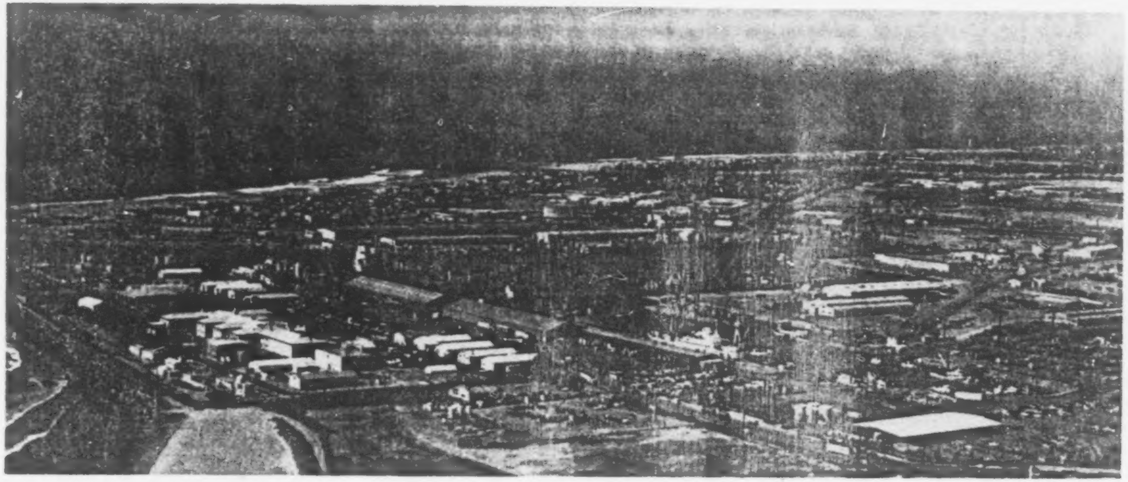
Port Hueneme Harbor

Soundings in fathoms

TRAFFIC SEPARATION SCHEME

One-way traffic lanes overprinted on this chart are RECOMMENDED for use by all vessels traveling between the points involved. They have been designed to aid in the prevention of collisions at the approaches to major harbors and along heavily traveled coastal waters, but are not intended in any way to supersede or to alter the applicable Rules of the Road. Separation zones are intended to separate inbound and outbound traffic and to be free of ship traffic. Separation zones should not be used except for crossing purposes. When crossing traffic lanes and separation zones use extreme caution.

Figure 4.9
Port Hueneme Harbor



San Francisco Bay Area
John F. Baldwin Ship Channel Dredging Project

The John F. Baldwin Ship Channel Project was authorized by Congress in 1965. This project is now 16 years old, and impact studies are ongoing. The project has already accounted for deepening the San Francisco Bar to 55 feet, and, if carried to completion, would deepen to 45 feet the navigational channel serving northern San Francisco Bay Area ports. Directly affected would be the ports of Benicia and Selby. It would also provide for authorizing the maintenance of a 35 foot channel serving the ports of Sacramento and Stockton.

The U.S. Army Corps of Engineers has estimated that, historically, the time required for a port project from inception to completion is 24 years. Assuming this to be true and assuming that no insurmountable impacts are discovered, the project could conceivably become a reality during the late 1980s, or in the 1990s. Actual timing and funding are dependent, however, on dredging legislation previously described. (See Appendix H for descriptive details of the John F. Baldwin Ship Channel Project.)

4. San Francisco, California

Property Owner: San Francisco Port Commission
(leased to Bayshore Bulk, Inc.)

Plans:

Development of terminal with throughput capacity of 10 million + tons per year. Vessels to 125,000 DWT to be accommodated.

Schedule: None Announced.

Site Characteristics:

Size	70 acres
Water Frontage	1,000 feet
Water Depth	channel - 50 feet existing
	alongside - 31 feet existing
	- 50 feet planned
	mean tidal range - 6 feet

Present Use: Vacant

Dredging:

No channel deepening required. Dredging alongside to equalize channel depth.

Rail Service:

Southern Pacific currently serves site. Several at-grade crossings on the San Francisco peninsula.

Environmental/Permit Issues:

Other than potential road/rail conflicts, no significant impacts reported.

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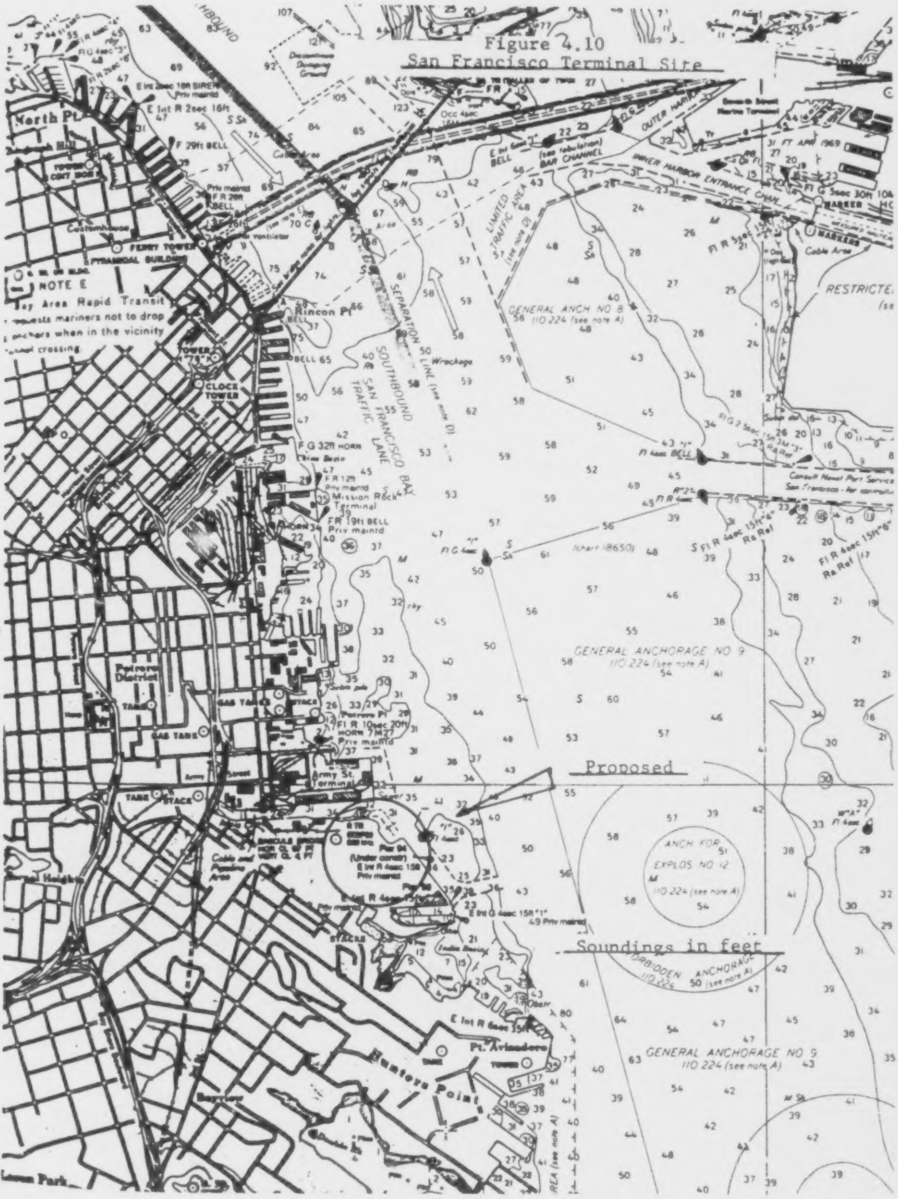

Figure 4.10
San Francisco Terminal Site

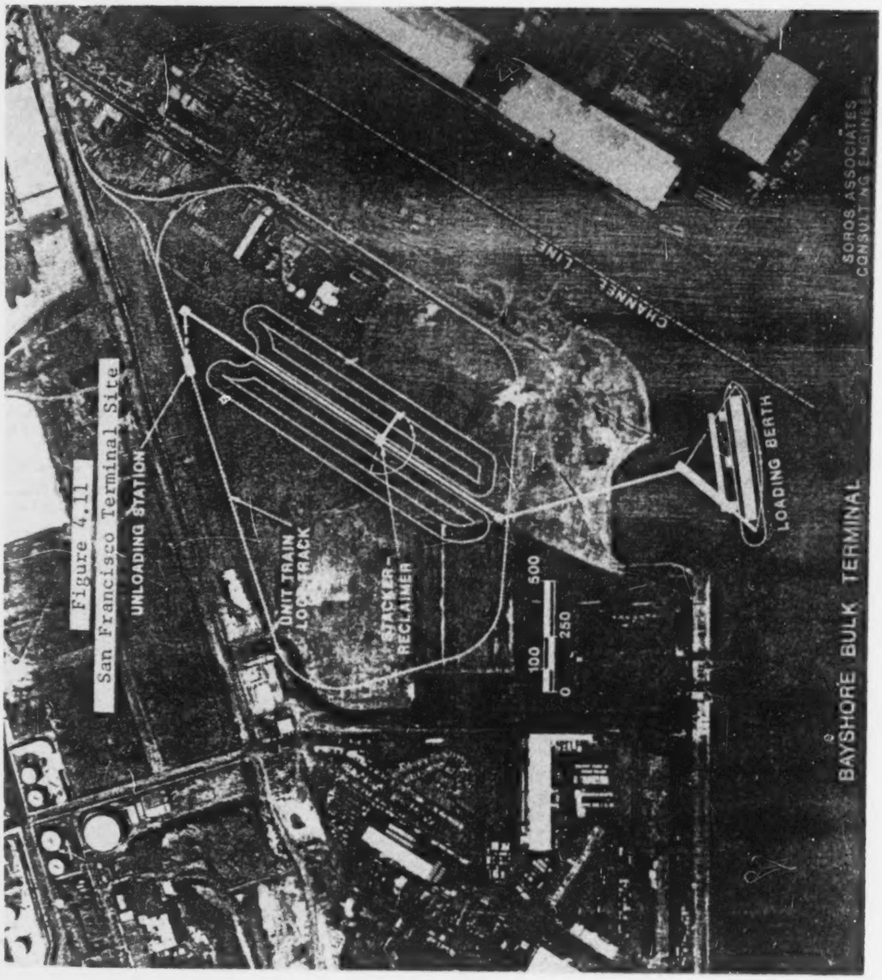

Figure 4.11
San Francisco Terminal Site

5. Redwood City, California

Property Owner:	Port of Redwood City (Phase 1) Private Owner (Phases 2 and 3 - contact through port)

Plans:

Phase 1	1.5 - 2 million tons per year throughput with 200,000 tons ground storage, in four 50,000 ton segregated lots.
Phase 2	10-15 million tons per year throughput with one million tons ground storage
Phase 3	20-30 million tons per year throughput with 1.9 million tons ground storage

Schedule:

Negotiations, environmental, and design efforts underway. Construction of Phase 1 to begin January 1982 and be completed in summer 1982. Phase 2, 1984 completion; Phase 3, 1986 completion.

Site Characteristics:

Size	Phase	1	10 acres
	Phase	2	70 acres
	Phase	3	138 acres
Water Depth	channel - 32 feet existing		
	alongside - 36 feet existing		
	mean tidal range - 7.5 feet		
Present Use:	Phase 1 - bulk commodity storage		
	Phases 2, 3 - vacant		

Dredging:

In late 1980, the Corps of Engineers commenced a study of deepening the channel to 40 feet. The port expects project completion for Phase 2.

Rail Service:

Service to be by Southern Pacific Railroad on existing trackage adjacent to dock and site for Phase 1. Right-of-way presently exists for Phase 2 and Phase 3 rail extension.

Environmental/Permit Issues:

No significant impacts reported.

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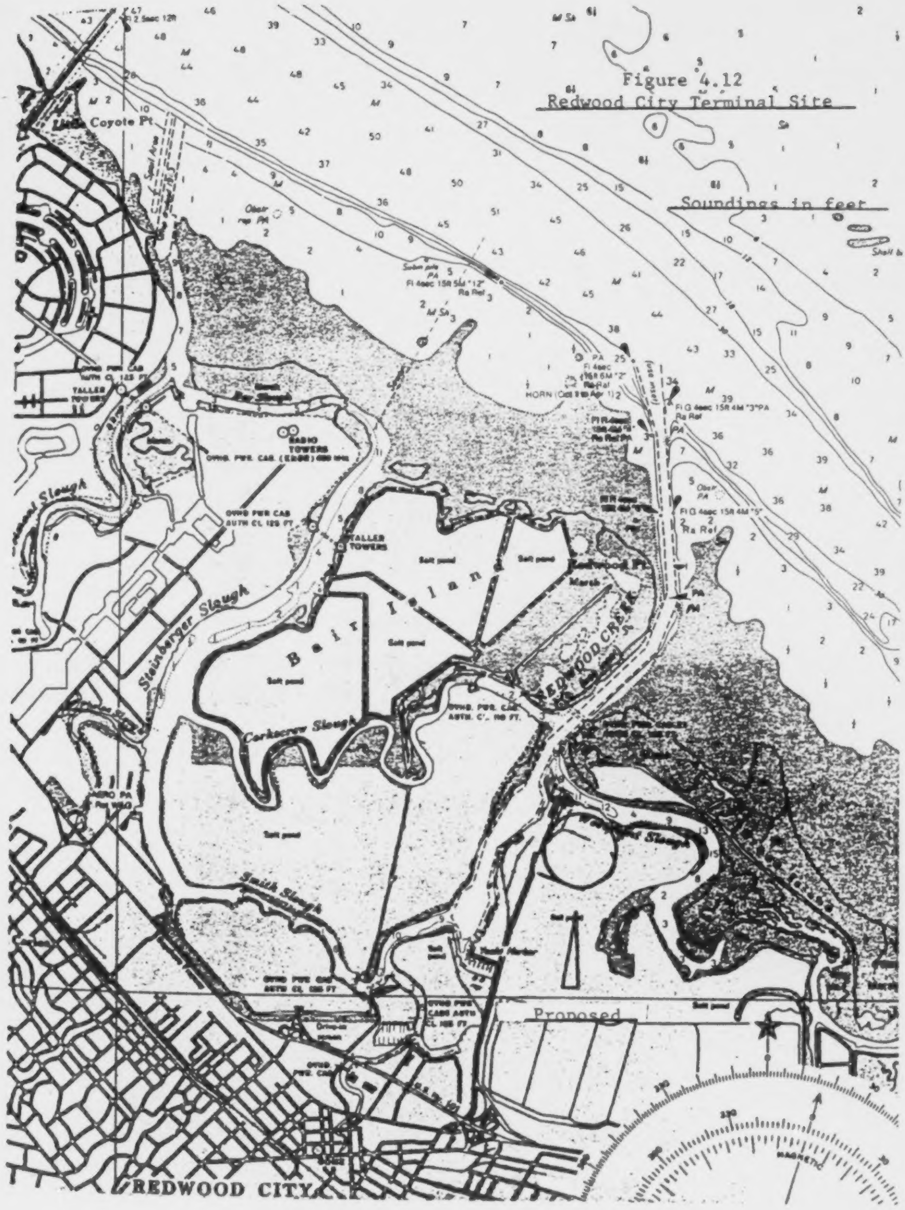
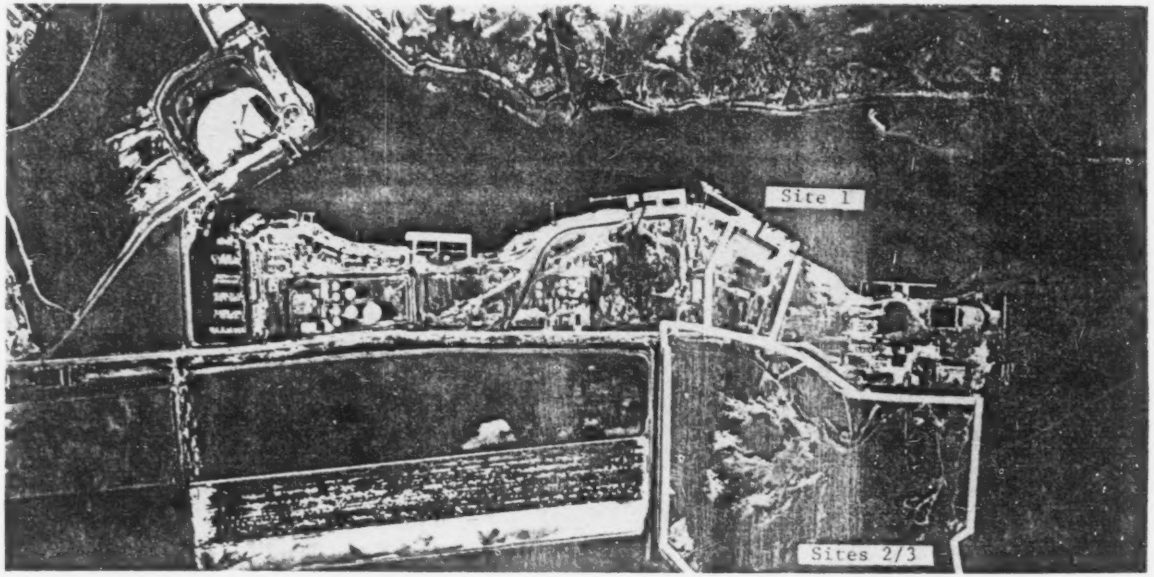


Figure 4.12
Redwood City Terminal Site

Soundings in feet

Figure 4.13
Redwood City Terminal Site



6. Richmond, California

Property Owner: Port of Richmond

The Port of Richmond reports that it is a suitable location for coal terminal development but that no detailed analysis has been made as yet. Therefore, no site specific information is available.

The harbor channel is currently maintained at a depth of 35 feet, and a District Corps of Engineers study on dredging to 41 feet is scheduled for completion in late 1981. Tidal range between mean lower low water and mean higher high water is 5.8 feet.

Rail service to the Port of Richmond is by the Southern Pacific and the Atchison, Topeka and Santa Fe.

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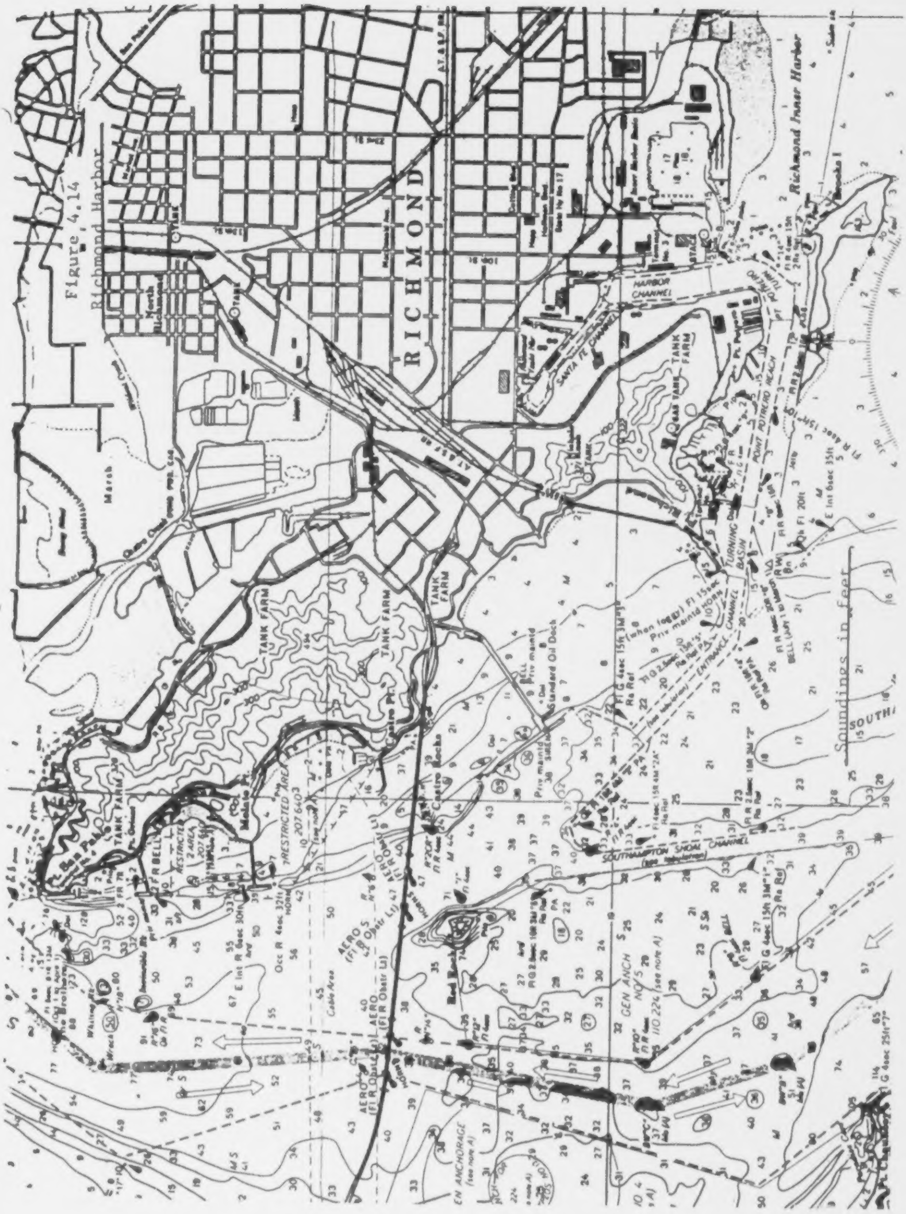

Figure 4.14
Richmond Harbor

7. Selby, California

Property Owner: Wickland Oil Company

Plans:

Development of terminal with throughput capacity of 15 million tons per year. Vessels up to 125,000 DWT to be light loaded as required by channel depth. On-site coal storage capacity for up to 1,500,000 tons. Unloading time for 80 car unit trains in less than 2 hours. Railroad unit train staging ability for 3 unit trains close by, while one complete unit train is unloading on-site. Preliminary project cost estimate is $80 to $100 million.

Schedule:

Permit applications were filed September 2, 1981. Construction scheduled for January 1, 1983. Operations to commence January 1, 1985.

Site Characteristics:

Site	308 acres
Water Frontage	4,000 feet
Water Depth	channel - 35 feet existing alongside - 50 feet planned
Present Use:	Petroleum terminal under construction on portion of property.

Dredging:

No dredging required for 35 foot operations. After 1982, 36 feet will be available. Channel deepening to 45 feet authorized, but impacts still under study. Model studies of possible salinity intrusion required. No funding yet approved. Wickland estimates project completion in late 1980's. See general John F. Baldwin discussion plus Appendix H for details.

Rail Service:

The site is currently served by a one mile portion of the double track main line of the Southern Pacific Railroad.

Environmental/Permit Issues:

No significant impacts reported other than those from dredging the existing 35 foot channel to 45 feet.

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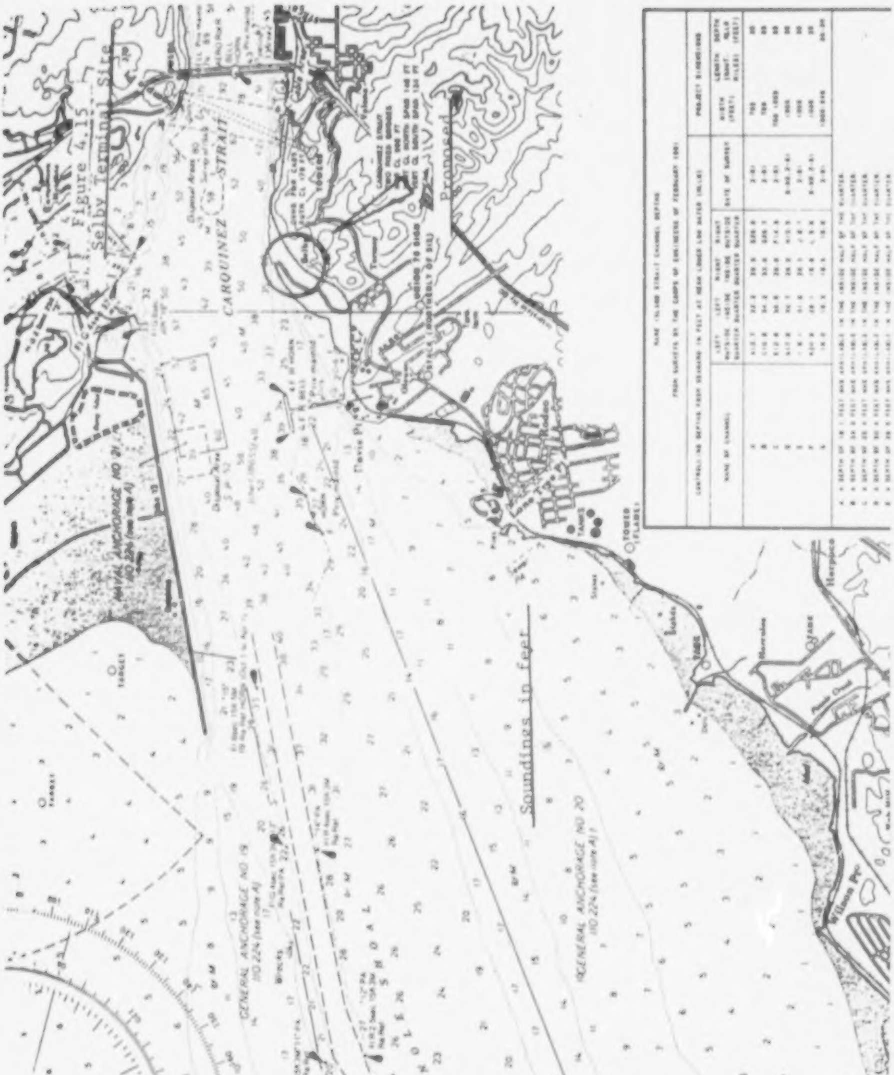

Figure 4.15 Selby Terminal Site

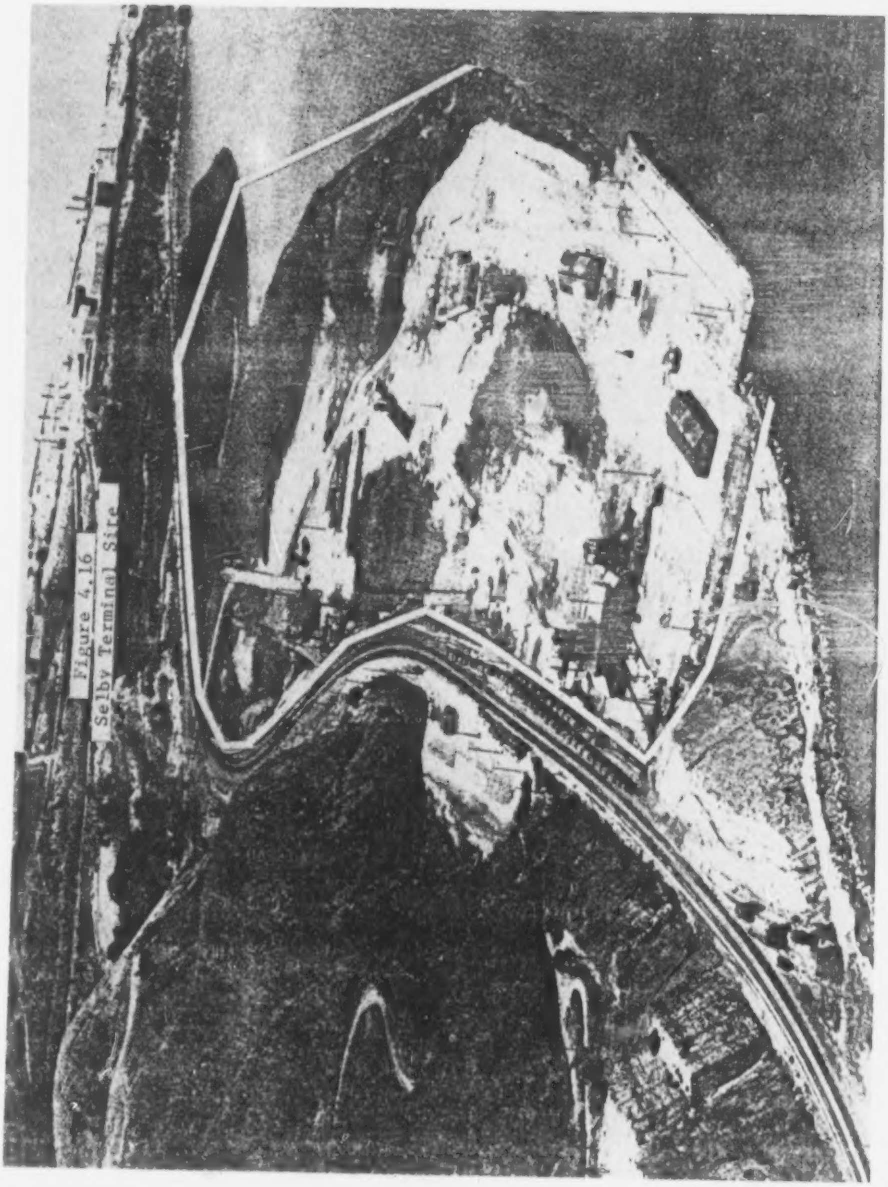

Figure 4.16
Selby Terminal Site

8. Benicia, California

Property Owner:	Benicia Industries, Inc.
Plans/Schedule:	None announced.

Site Characteristics:

Size	150 acres
Water Frontage	site one-quarter mile from existing 2,400 foot wharf
Water Depth	channel - 35 feet existing alongside - 38 feet existing maximum tidal range - 8.5 feet
Present Use:	Water-related industry.

Dredging:

Channel depth of 45 feet authorized, but impacts still under study. Model studies of possible salinity intrusion required. No funding yet approved. Scheduled commencement reported as 1985. See general John F. Baldwin discussion plus Appendix H for details.

Rail Service:

Southern Pacific currently serves site.

Environmental/Permit Issues:

No significant impacts reported other than those from channel dredging.

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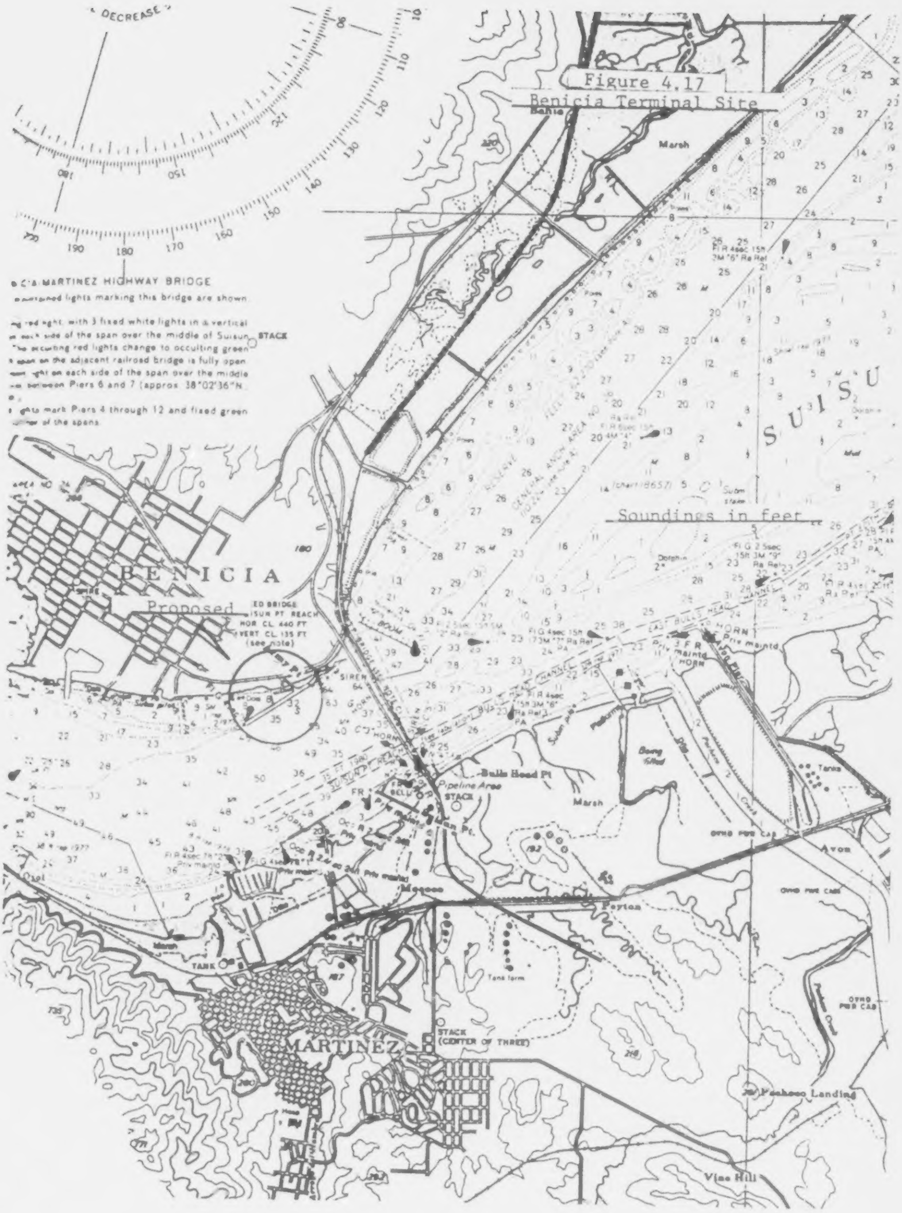


Figure 4.17
Benicia Terminal Site

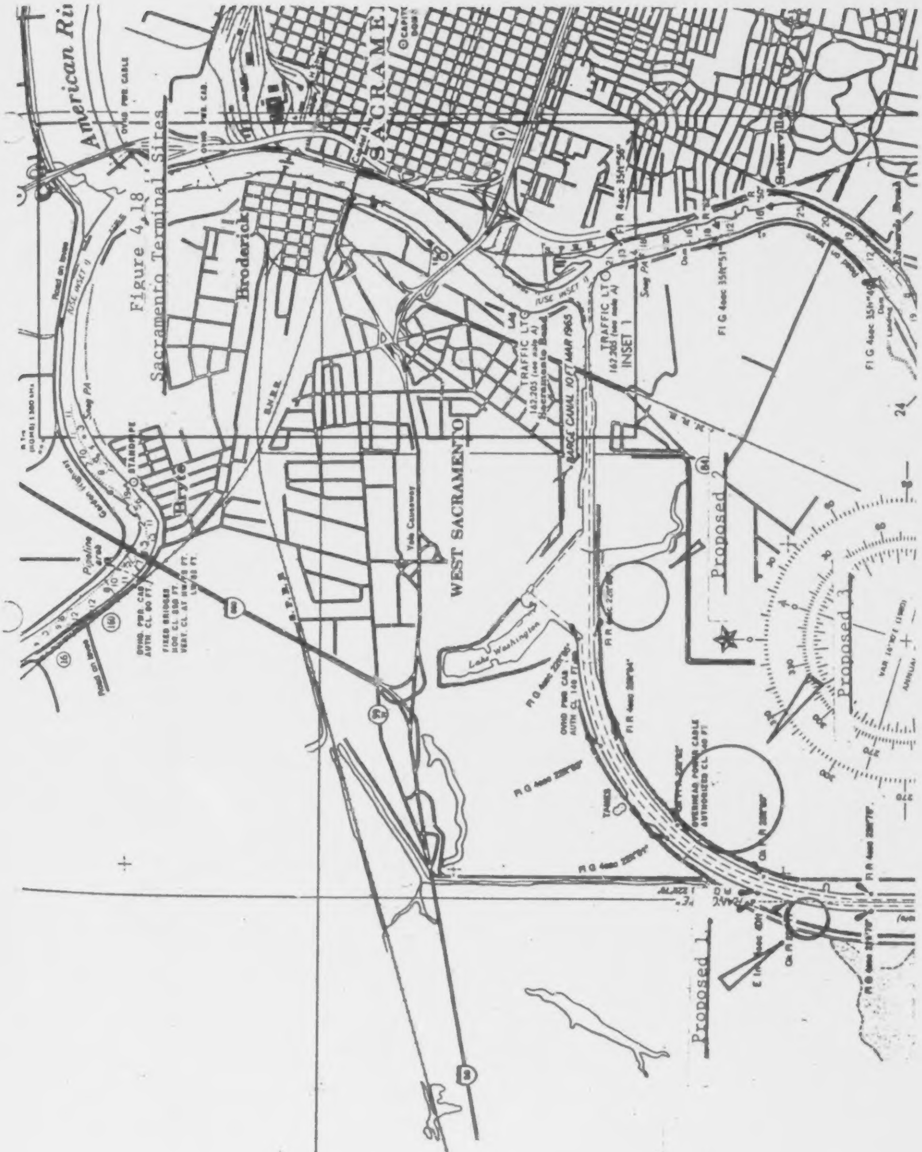


Figure 4.18
Sacramento Terminal Sites

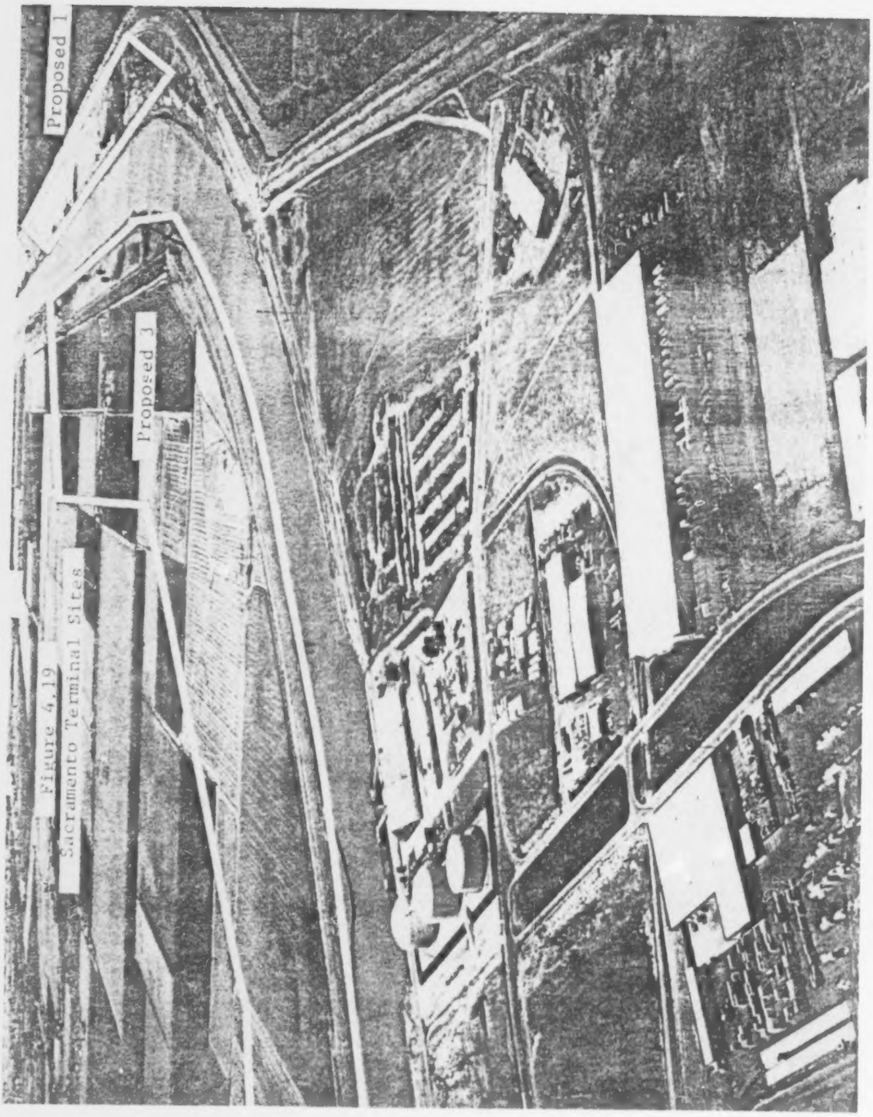
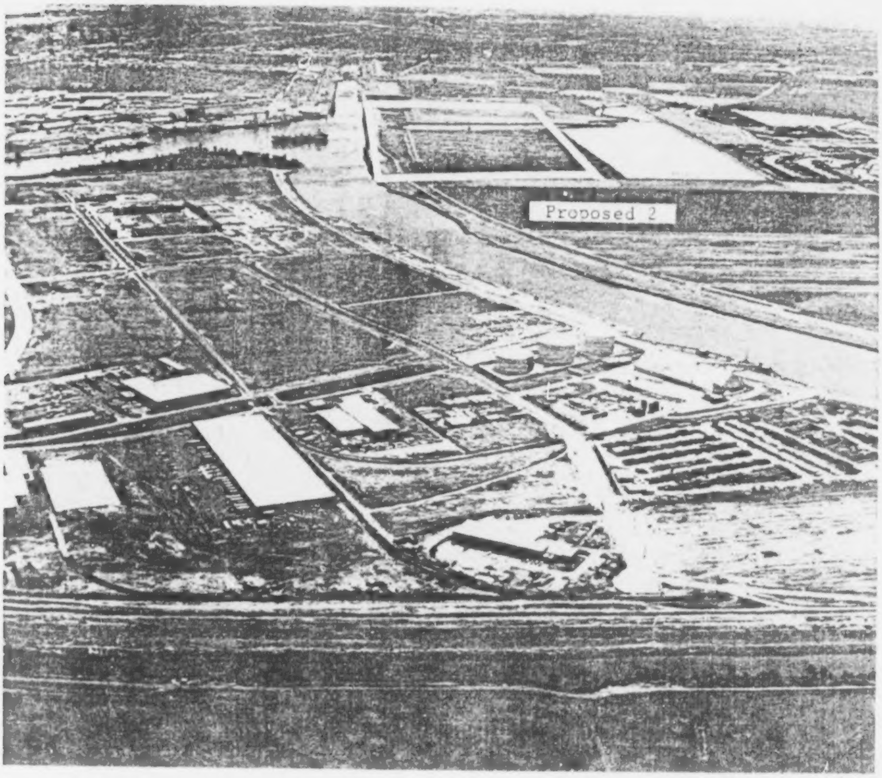


Figure 4.19 Sacramento Terminal Sites

Figure 4.20
Sacramento Terminal Sites



9. Sacramento, California

Property Owner: Sacramento - Yolo Port District
(Sites 1 and 2)
Private owner
(Site 3 - contact through port)

Plans:

Site 1/phase 1: 2.5 - 3 million tons per year. Sites 2 or 3/phase 2: 5 - 10 million tons per year. Vessels 60-70,000 DWT loaded to capacity subject to sailing draft restrictions. In addition port plans system to top off these vessels at anchorage in San Francisco Bay.

Schedule:

Negotiations and design efforts underway. Planning and construction of phase 1 to require 1.5 - 2 years; phase 2 to require 5 years.

Site Characteristics:

Size	site 1 - 10 acres in combination with other port owned property site 2 - 200 - 300 acres site 3 - several hundred acres available
Water Frontage	site 3 - several thousand feet
Water Depth	channel - 30 feet existing alongside - 35 feet planned mean tidal range - 5 feet

Present Use: Agricultural

Dredging:

Sacramento River Deep Water Ship Channel. The proposed Chief of Engineers report, which recommends deepening the existing Avon to Sacramento Channel to 35 feet at a total cost of $79.9 million, is undergoing the 90-day State and agency review. The final Chief's report is expected to be forwarded to the Secretary of the Army in late 1981. Salinity intrusion into the Sacramento-San Joaquin Delta is an environmental concern.

Rail Service:

Service to be by Southern Pacific and Western Pacific. Tracks 0.5 - 1.0 mile distant.

Environmental/Permit Issues:

- Salinity intrusion of dredging.
- Nonattainment area for State air quality standards.
- No other significant impacts reported.

Melvin Shore
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Port of Sacramento
World Trade Center
West Sacramento, CA
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TWX 910-367-3531

10. Stockton, California

Property Owner: Stockton Port District

Plans:

Expand existing capability to allow throughput up to five million tons per year. Storage of 500,000 tons. Vessels up to 60,000 DWT to be accommodated.

Schedule:

Available for immediate construction if business warrants. Anticipated start-up 1982-83.

Site Characteristics:

Size	73 acres
Water Frontage	access to docks by conveyor (approximately 1000 feet)
Water Depth	channel - 32 feet existing - 37 feet planned alongside - 35 feet existing 40 feet planned average tidal range - 4 feet
Present Use:	Port related.

Dredging:

Authorized project depth of 35 feet delayed due to impact studies now completed. Port states that deepening will commence in 1982.

Rail Service:

Approximately one mile to main line. Service by Western Pacific, Southern Pacific, and Atchison, Topeka and Santa Fe.

Environmental/Permit Issues:

- Air quality nonattainment area.
- No other significant impacts reported.

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Port of Stockton
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Stockton, CA 95201
(209) 946-0246
Telex 35-9467
TWO 510-765-6661

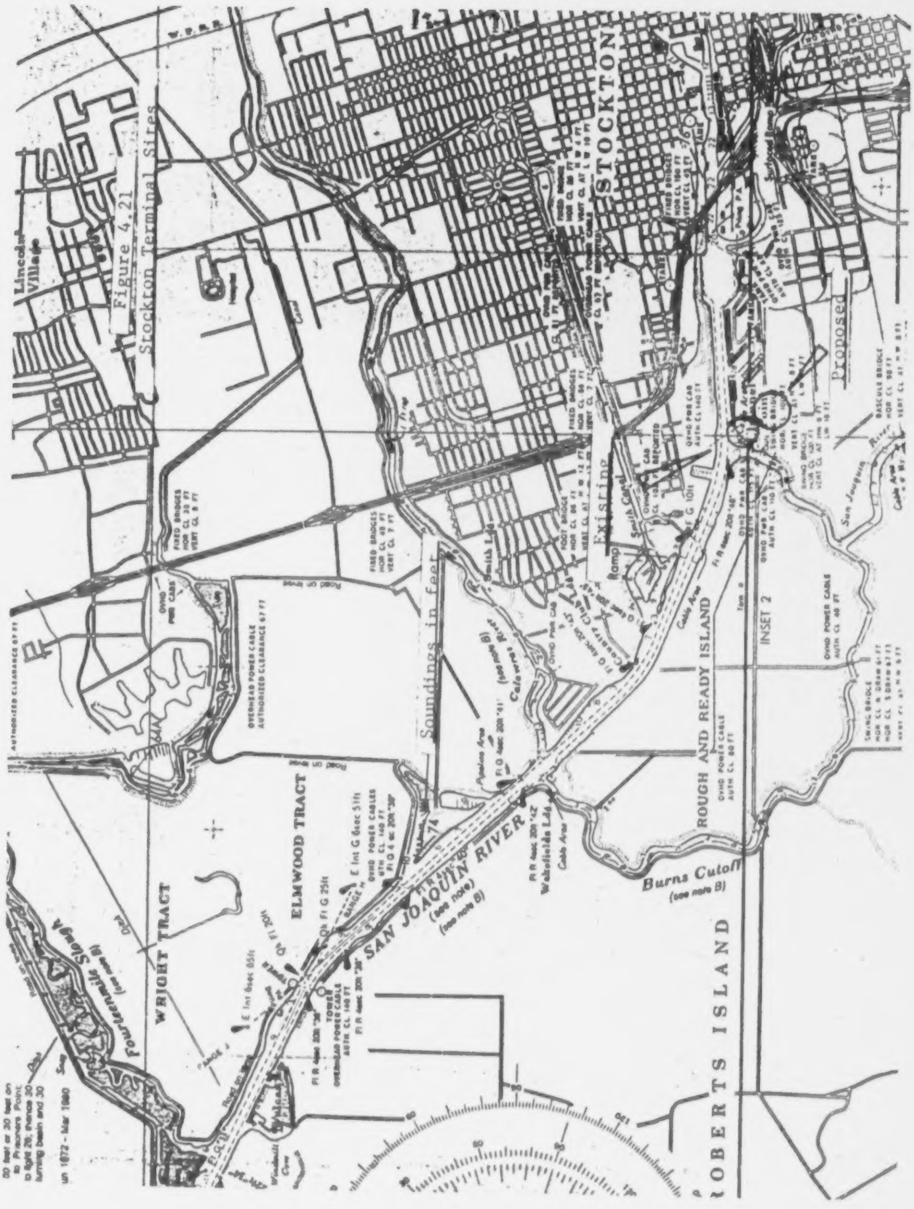

Figure 4.21
Stockton Terminal Sites

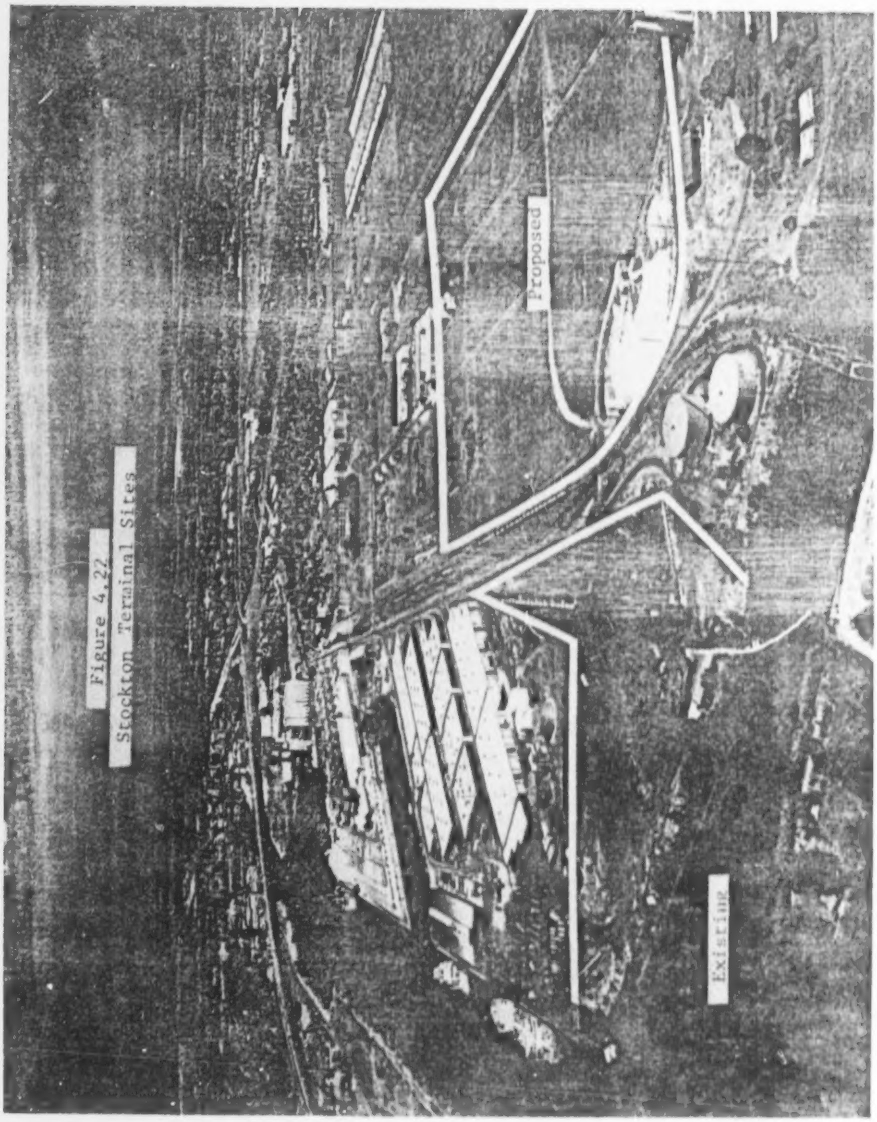

Figure 4.22
Stockton Terminal Sites

11. Coos Bay, Oregon

Property Owner: Port of Coos Bay

Plans:

Development of terminal with throughput capacity of 12 million tons per year. Ground storage of one million tons. Vessels 50-60,000 DWT to be accommodated (37' maximum draft). Developer to be Canasia Coal Company of Coos Bay.

Schedule:

Federal Environmental Impact Statement currently being reviewed. Permits expected to be granted in mid 1982. Construction schedule not announced.

Site Characteristics:

Size	70 acres
Water Frontage	2,000 feet
Water Depth	bar - 45 feet existing channel - 35 feet existing alongside - 45 feet planned mean tidal range - 6 feet

Present Use: Vacant.

Dredging:

No channel deepening announced. 700,000 cubic yards dredging required for terminal development.

Rail Service:

One mile to existing trackage; three miles to Coos Bay/Eugene branch of Southern Pacific. All level rights-of-way in hand.

Environmental/Permit Issues:

No significant impacts reported.

Jeffrey Cooper
Acting Director
Port of Coos Bay
P.O. Box 1226
Coos Bay, OR 97420
(503) 269-1131

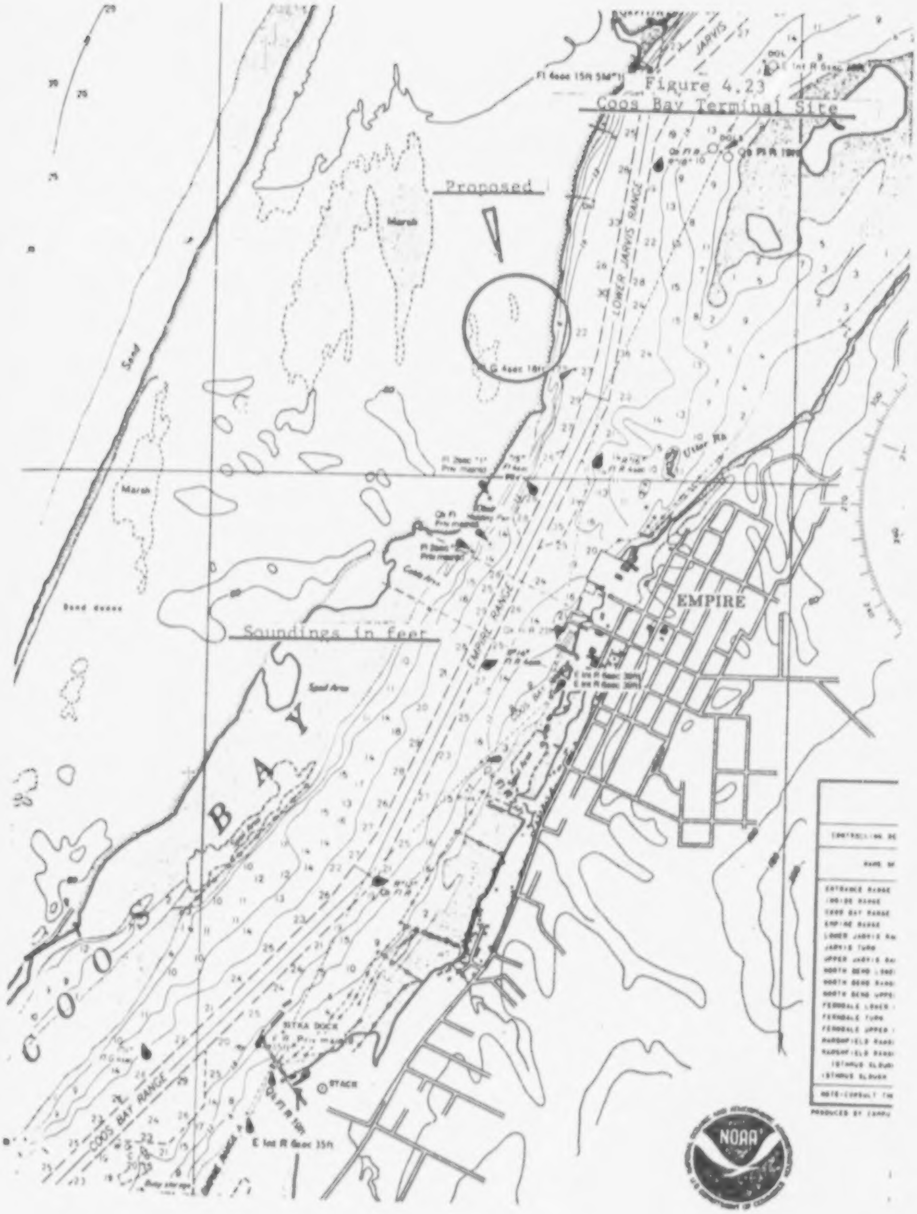

Figure 4.23
Coos Bay Terminal Site

Proposed

Soundings in feet

12. Grays Harbor, Washington

Property Owner: Port of Grays Harbor

Plans:

Development of terminal with throughput capacity of 10 million tons per year. One million tons ground storage. Vessels up to 60,000 DWT to be accommodated.

Schedule:

Technical feasibility study and concept design to be completed by September 1981. Start-up by 1986.

Site Characteristics:

Size	176 acres
Water Frontage	2,000 feet
Water Depth	channel - 30 feet existing
	- 40 feet planned
	alongside - 40 feet planned
	tidal range - 10 feet
	controlling draft - 34 feet existing with tidal advantage 44 feet planned
Present Use:	Vacant.

Dredging:

Berth development 450,000 cubic yards.

A Corps of Engineers feasibility report is scheduled for completion in late 1982. The proposed plan provides for deepening the outer bar channel to 48 feet, entrance channel to 45 feet and bay channel to 40 feet. No major environmental constraints known at this time. Dredging schedule, if project becomes authorized, is unknown at this time.

Rail Service:

Burlington Northern adjacent to site; Union Pacific also serves port. Realignment of 4.6 miles being considered to avoid existing residential areas and to minimize crossing conflicts.

Environmental/Permit Issues:

- Currently 15 at-grade rail crossings. Two major.
- Adjacent to wetlands, but concept of bulk cargo terminal accepted by state and federal resource agencies.
- Dredging must be scheduled to avoid periods of fish migration.

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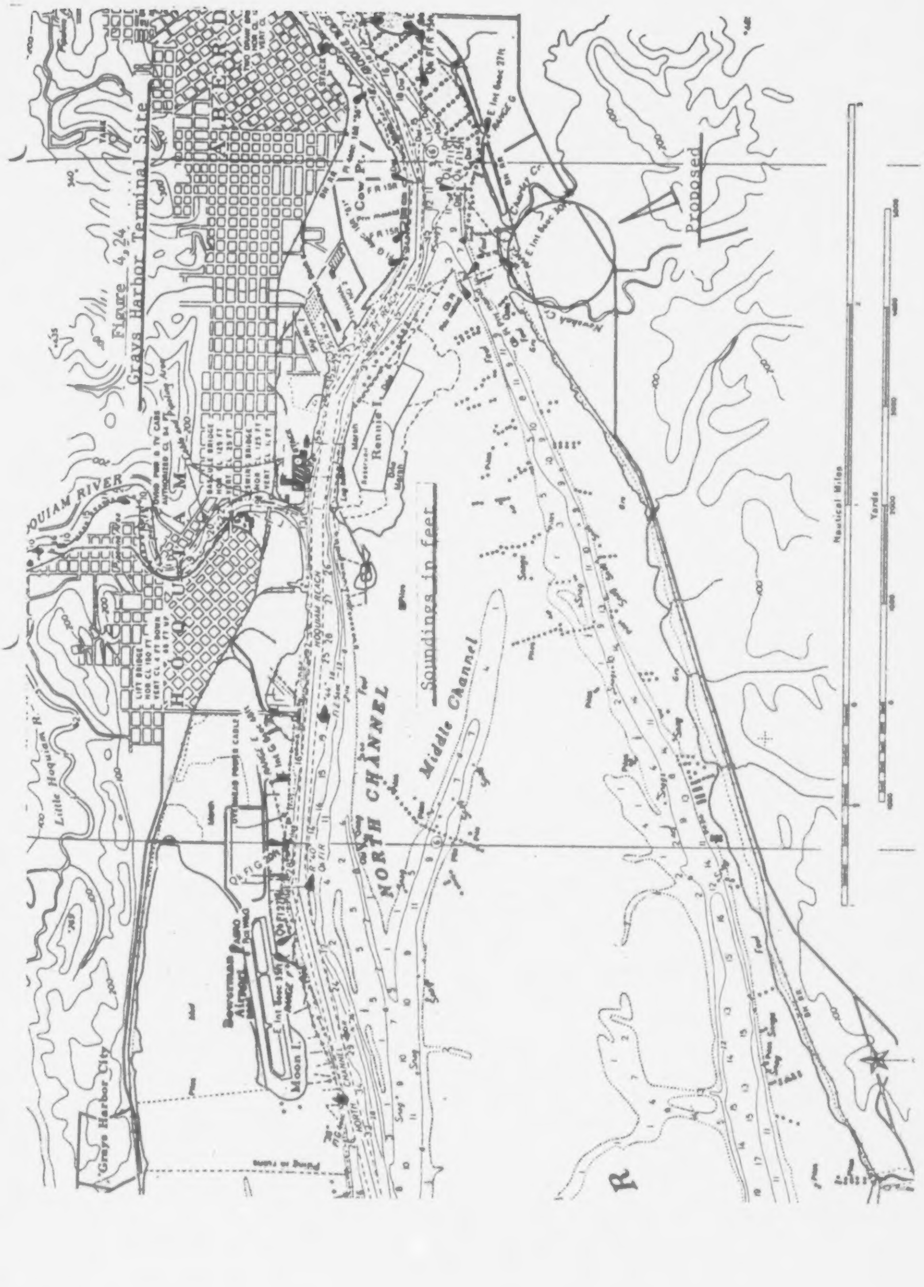


Figure 4.24
Grays Harbor Terminal Site

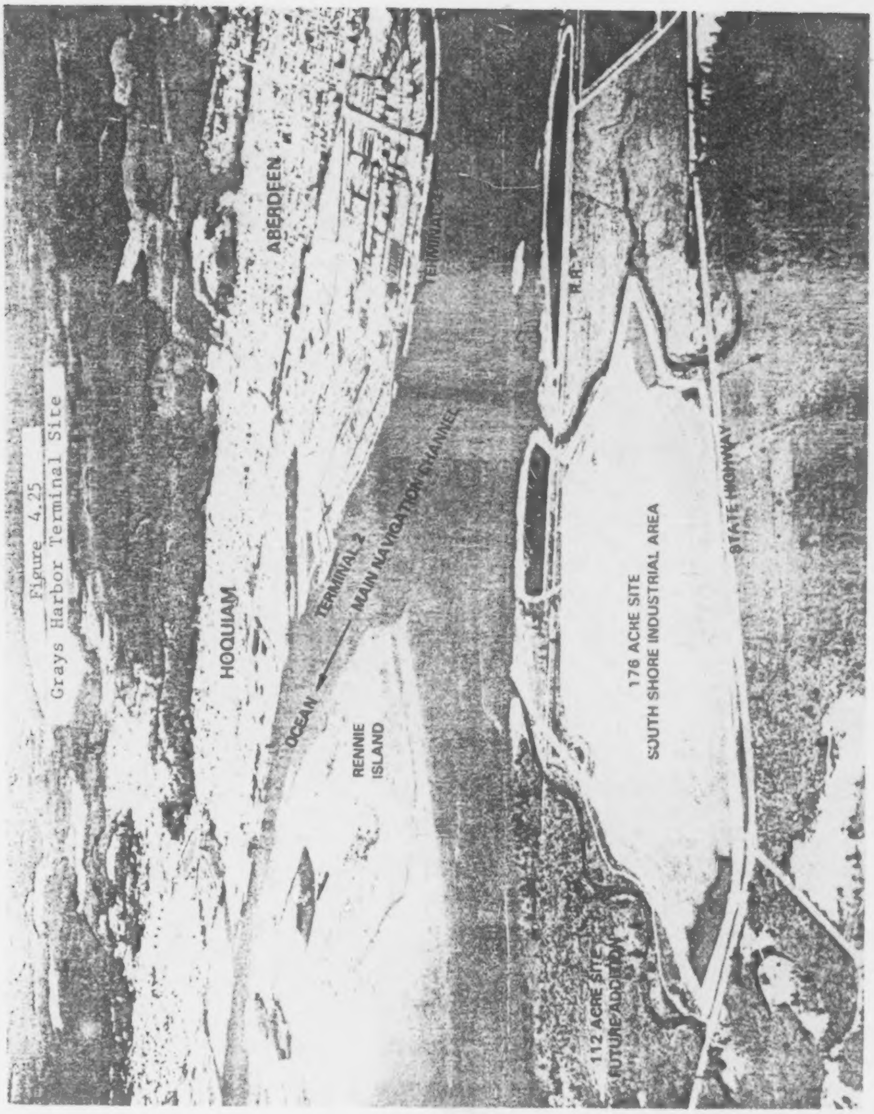


Figure 4.25
Grays Harbor Terminal Site

Columbia River, General

Mouth of Columbia River and Columbia and Lower Willamette Rivers. Ports included: Astoria, Saint Helens and Portland, Oregon; Kalama, Vancouver and Longview, Washington. The river channel is dredged to a depth of 40 feet, 600 feet wide, and 750 feet at turns.

The existing Mouth of Columbia project provides for a channel 48 feet deep and one-half mile wide at the river mouth. The channel crosses the ocean bar and extends upstream into the river mouth for three miles where it joins with a 40-foot deep channel extending 110 miles to Portland, Oregon. (Bar pilots ordinarily recommend that vessels entering the river draw no more than 38 feet. In 1980, however, four vessels of 39 foot draft and two of 40 foot are reported to have transitted the Columbia River.)

A feasibility study, scheduled for completion in fiscal year 1983, is underway to determine the need for project deepening at the mouth of the Columbia River. Timing for actual dredging, if any, is unknown at this time. Major environmental constraints are unknown. Costs would be dependent on channel configuration which is yet to be determined.

The Port of Portland Commission has requested that if dredging the bar is authorized the Corps of Engineers study the feasibility of deepening the entire Columbia River Channel beyond its present 40-foot depth. The resolution has been transmitted to the Oregon Congressional delegation. The Port of Portland is the local sponsor of this project.

13. Warrenton, Oregon

Property Owner:	Warrenton Lumber Company (subsidiary of Dant & Russell, Inc.)

Plans:

Staged development of terminal with ultimate capacity of 10-11 million tons per year. Initial stage 3-5 million tons delivered by barge. Expansion when rail line upgraded. Ground storage one million tons. Vessels up to 50,000 DWT accommodated; 80,000 DWT as design allows; 100,000 DWT if dredging occurs.

Schedule:

Permits by end of 1982. Financing by end of 1983. Construction and start-up by 1986 (assuming contracts). Phase two by 1990.

Site Characteristics:

Size	130 acres
Water Frontage	1,200 feet on Columbia River 4,400 feet on Skipanon River
Water Depth	channel - 40 feet existing alongside - 40 feet existing mean tidal range - 7 feet
Present Use:	Part vacant; part log sorting and lumber mill.

Dredging:

Minimal for development. See general Columbia River discussion for potential channel deepening.

Rail Service:

Burlington Northern onsite. 18 month upgrading program required to handle unit trains. Major constraint is replacing Young's Bay Bridge at estimated cost of $10 - 15 million.

Environmental/Permit Issues:

- Proposed eight acre wetland fill may require modification.
- No other significant impacts reported.

Edward D. Christie
Dant & Russell, Inc.
1221 S.W. Yamhill St.
Portland, OR 97205
(503) 221-1644
Telex 36-0523

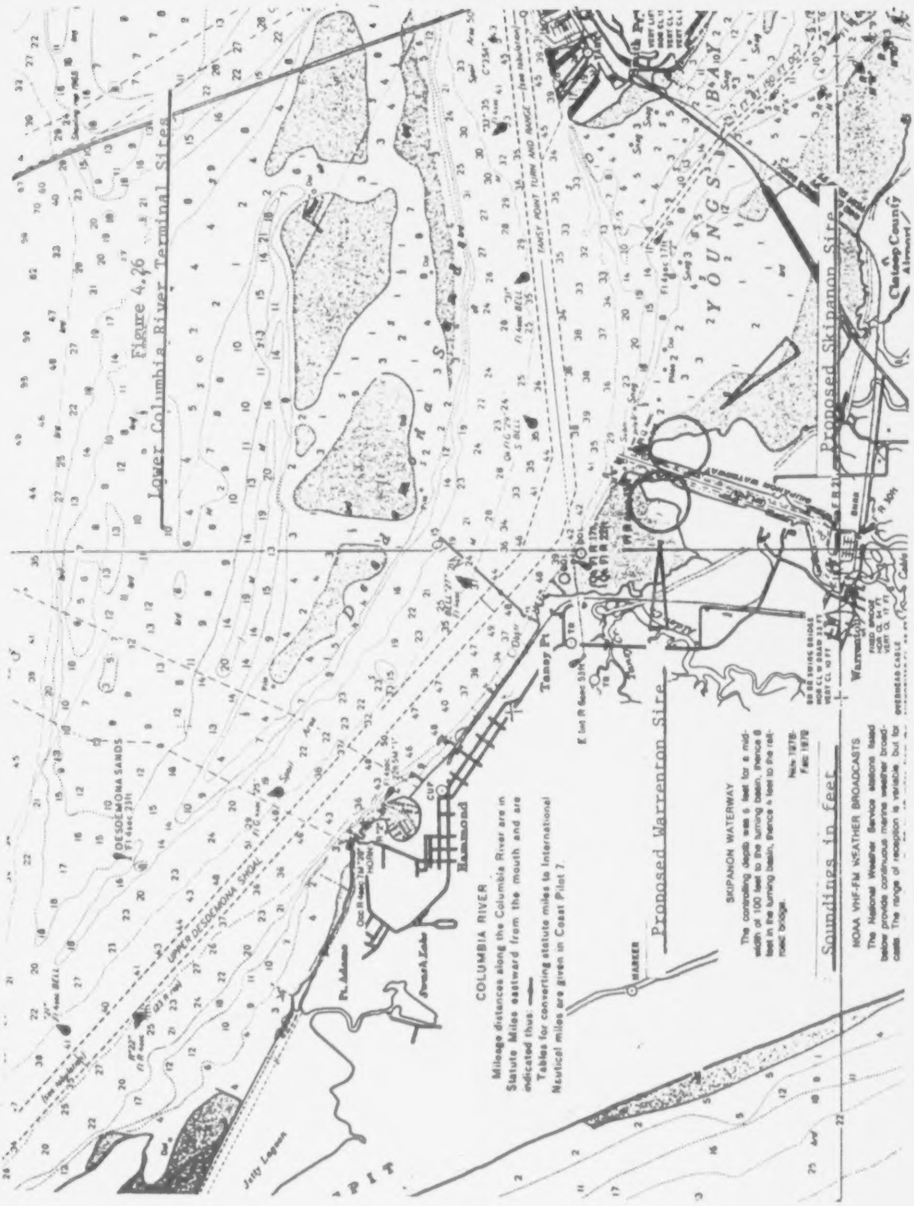
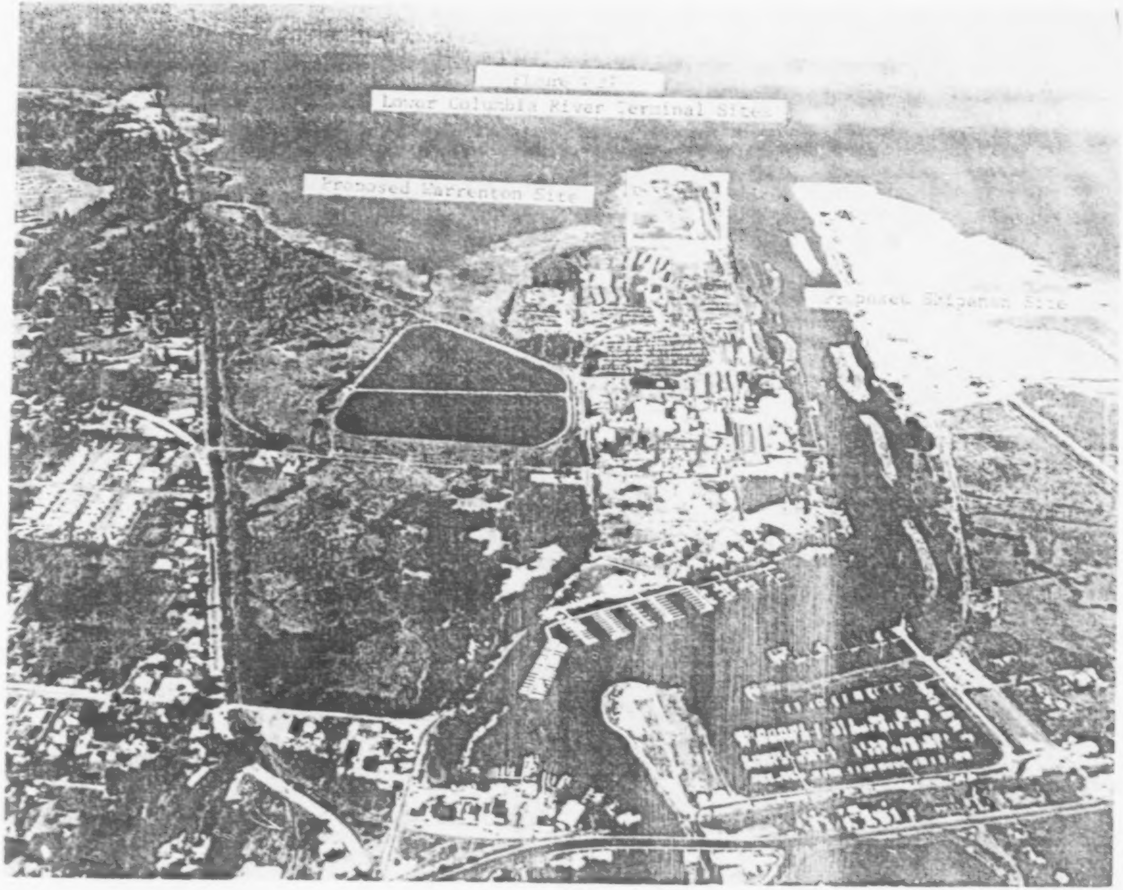


Figure 4.26
Lower Columbia River Terminal Sites

Proposed Warrenton Site
Proposed Skipanon Site
Soundings in feet
COLUMBIA RIVER
Mileage distances along the Columbia River are in Statute Miles eastward from the mouth and are indicated thus:
Tables for converting statute miles to International Nautical miles are given in Coast Pilot 7.
SKIPANON WATERWAY
The controlling depth was 6 feet for a mid-width of 100 feet to the turning basin, thence 6 feet in the turning basin, thence 4 feet to the railroad bridge.
Nov 1978-Feb 1979
NOAA VHF-FM WEATHER BROADCASTS
The National Weather Service stations listed below provide continuous marine weather broadcasts. The range of reception is variable, but for
DESDEMONA SANDS
UPPER DESDEMONA SHOAL
TANSY POINT TURN AND RANGE
Tansy Pt
Hammond
Pt. Adams
Jetty Lagoon
Warrenton
Clatsop County
MARKER
OVERHEAD CABLE
YOUNGS BAY


Lower Columbia River Terminal Sites
Proposed Warrenton Site
Proposed Skipanon Site

14. Astoria, Oregon

Property Owner:	Port of Astoria (Site 1 - Skipanon) Port of Astoria (Site 2 - Piers 2 and 3) State of Oregon (Site 3 - Tongue Point; marketed by Port of Astoria)

Plans:

All three sites being studied for terminal development to accommodate vessels of 60,000 DWT, larger if Columbia River Bar dredged. No estimate of Site 1 capacity; site 2, annual throughput 8.5 million tons; site 3, 10 - 15 million tons per year.

Schedule: None announced.

Site Characteristics:

Size	site 1 - 150 acres site 2 - 75 acres (including fill) site 3 - 55 acres (plus fill)
Water Depth	channel - 40 feet existing
Present Use:	site 1 - Vacant. site 2 - Port Piers 2 and 3. site 3 - Surplus port land.

Dredging:

Alongside to match channel depth. See general Columbia River discussion for potential channel deepening.

Rail Service:

Burlington Northern (BN) over 100-mile branchline. BN reported ready to upgrade to accommodate unit trains upon evidence of economic justification. Estimated cost $35 - 40 million. Additional $10 - 15 million required to improve rail bridge across Young's Bay to Site 1 (Skipanon), furthest downriver. Potential impacts of at-grade crossing between Portland and the three Astoria sites currently being studied.

Environmental/Permit Issues:

Potential for significant environmental considerations noted at Site 3 (Tongue Point). No significant impacts reported for Sites 1 or 2. Site 2 (Piers 2 and 3) reported to have least impact.

Mr. Floyd Shelton
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Port of Astoria
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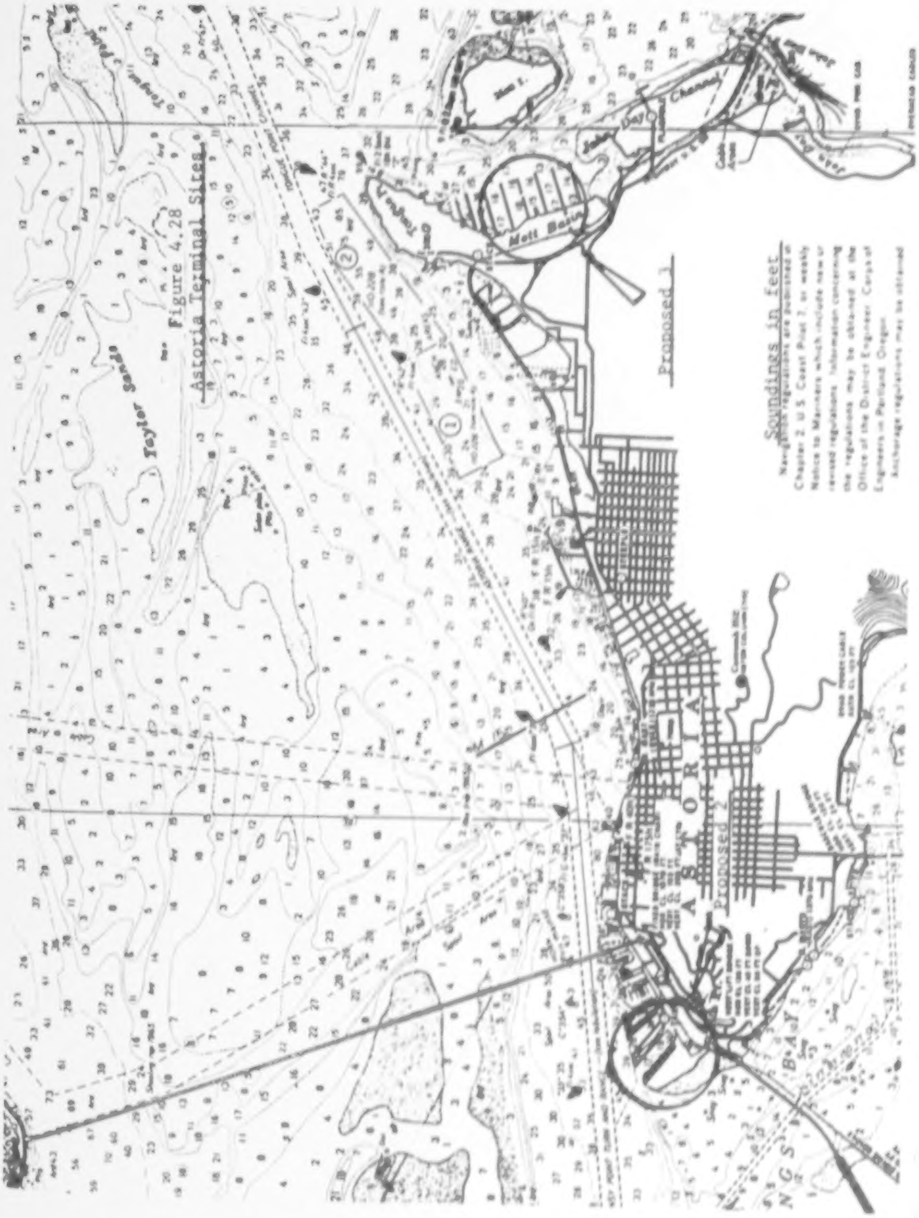

Figure 4.28
Astoria Terminal Sites

15. Portland, Oregon

Property Owner: Port of Portland

Plans:

Development of a multi-purpose bulk handling facility. Annual throughput 9 million metric tons coal; 2.25 million metric tons miscellaneous bulk. Ground storage 1.2 million tons. Vessels up to 60,000 DWT to be accommodated. Larger ships if shallow draft design. The Port of Portland has signed an agreement with Pacific Coal Corporation for construction and operation of a 9 million metric ton annual capacity coal shipping facility.

Schedule:

Air and water permit applications filed May 1981. Corps of Engineers application filed July 1981. Target construction date is March 1982. Facility scheduled to be on-line by January 1984.

Site Characteristics:

Size	110 acres	
Water Frontage	3500 feet	
Water Depth	channel -	40 feet existing
	alongside -	40 feet existing
	tidal range -	2-3 feet (low flow)

Present Use: Vacant.

Dredging:

Minimal for development. See general Columbia River discussion for potential channel deepening.

Rail Service:

Union Pacific (UP) adjacent to site. Burlington Northern also to serve via UP trackage.

Environmental/Permit Issues:

No significant impacts reported.

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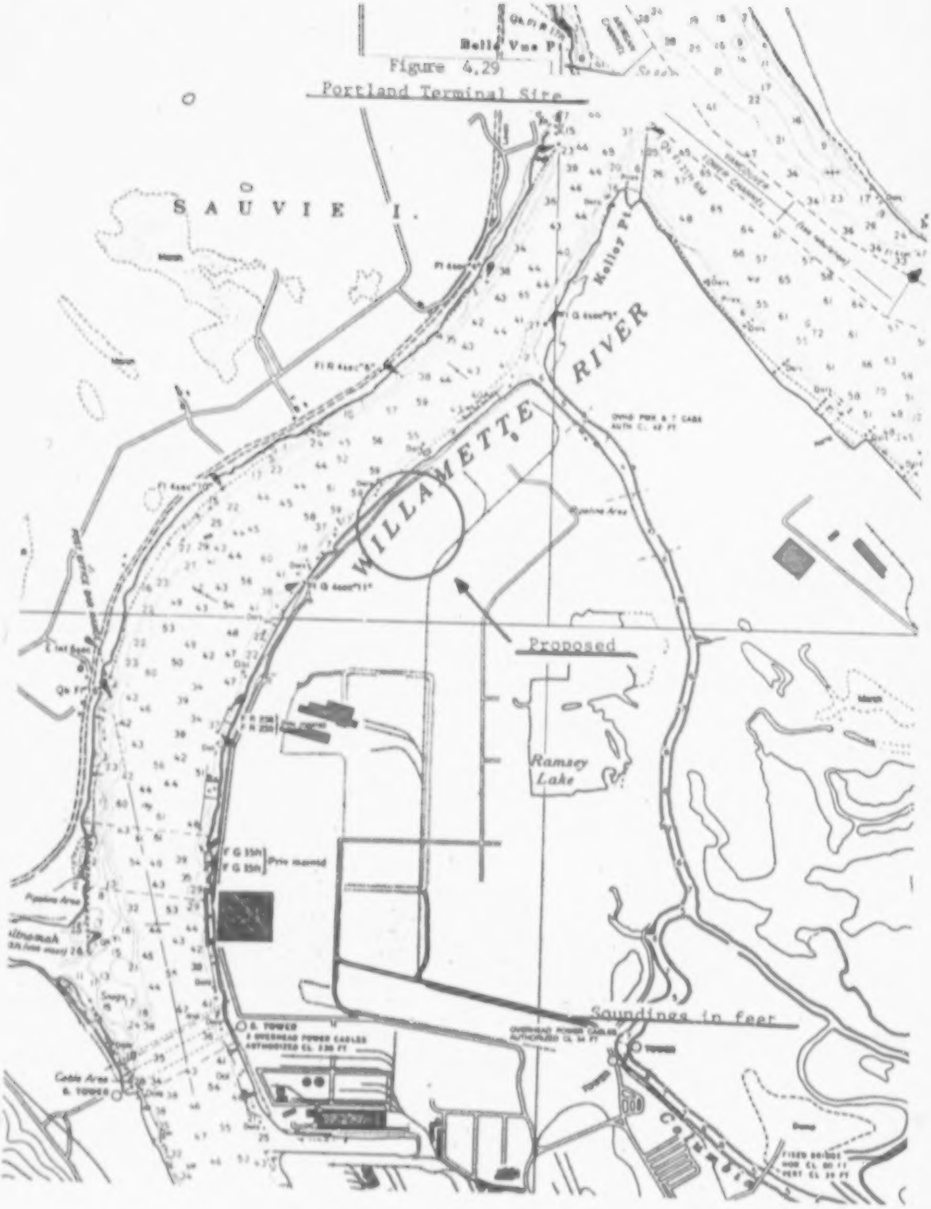

Figure 4.29

Portland Terminal Site

16. Vancouver, Washington

Property Owner:	Port of Vancouver
Plans:	Planned capacity for site 1 is 3 to 6 million tons per year (MTPY) and for site 2, 15 to 30 MTPY.
Schedule:	Zone change and environmental forms filed August 1981

	Permit approval	15 months
	Construction	18 months
	Start-up	late 1984 potential

Commission Date:	1984
Developer:	Westmoreland Resources Inc.

Site Characteristics:

Size	Site 1 - 45 acres Site 2 - 100-160 acres
Water Frontage	2.2 miles (river mile 93 to 95)
Water Depth	channel - 40 feet existing alongside - 40 feet existing tidal range - 2-4 feet (low flow) midriver depth offsite ranges to 55 feet. Sufficient for turning basin without further dredging
Present Use:	Agriculture
Dredging:	Minimal for development. See general Columbia River description for potential channel deepening.

Rail Service:

Burlington Northern/Union Pacific double mainline 1,100 feet distant separated from site by 200 foot wide river.

Environmental/Permit Issues:

Potential environmental impacts are described in detail in the accompaniment to the Port's zone change application. Air quality, water quality, noise, increases in traffic and impacts on wildlife, including those in the adjacent National Wildlife Refuge, are all discussed.

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Port of Vancouver
P.O. Box 1180
Vancouver, WA 98666
(206) 693-3611

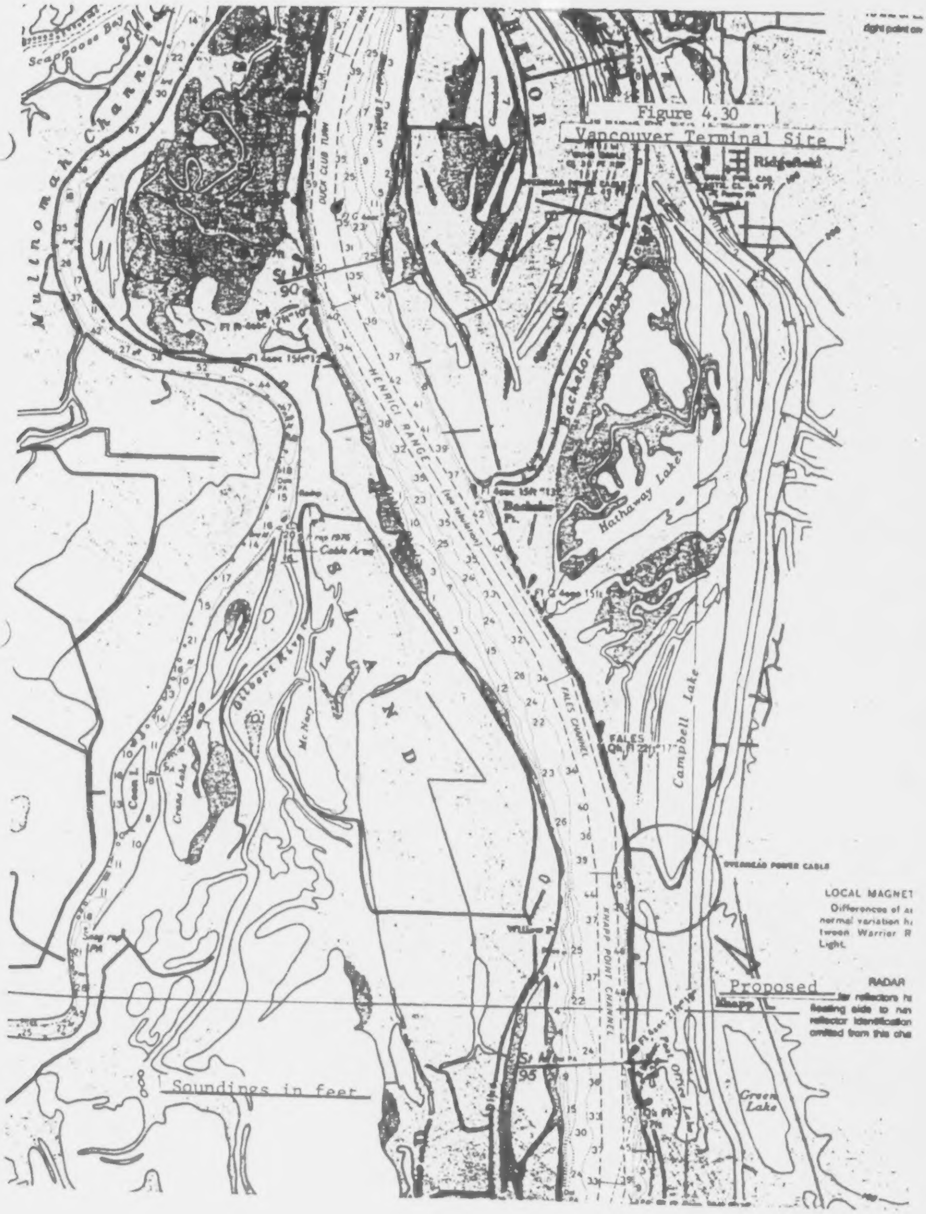


Figure 4.30
Vancouver Terminal Site

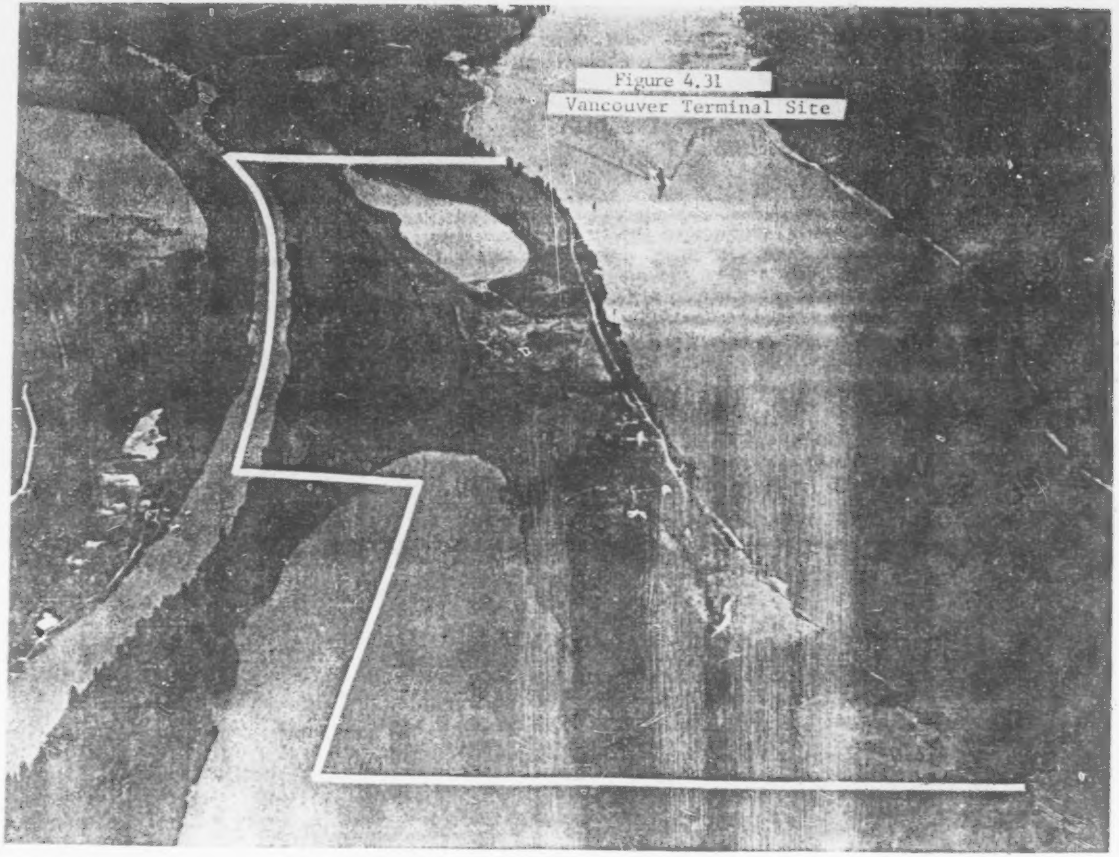


Figure 4.31
Vancouver Terminal Site

17. Kalama, Washington

Property Owner: Port of Kalama
(leased to Pacific Resources, Inc.)

Plans:

Development of a 15 million ton per year facility. Ground storage two million tons. Vessels up to 60,000 DWT to be accommodated at three loading berths; 85,000 DWT if shallow draft design. Developer: Pacific Resources, Inc.

Schedule:

Draft Environmental Impact Statement filed June 1981. Construction to commence April 1982; start-up January 1984.

Site Characteristics:

Size	175 acres
Water Frontage	4,500 feet (River Mile 72)
Water Depth	channel - 40 feet existing alongside - 40 feet existing tidal range - 1.5 feet

Present Use: Site is clear and is used for dredge spoils disposal.

Dredging:

Minimal for Phase One Site - 1,700 cubic yards. See general Columbia River discussion for potential channel deepening.

Rail Service:

Burlington Northern/Union Pacific mainline adjoins property.

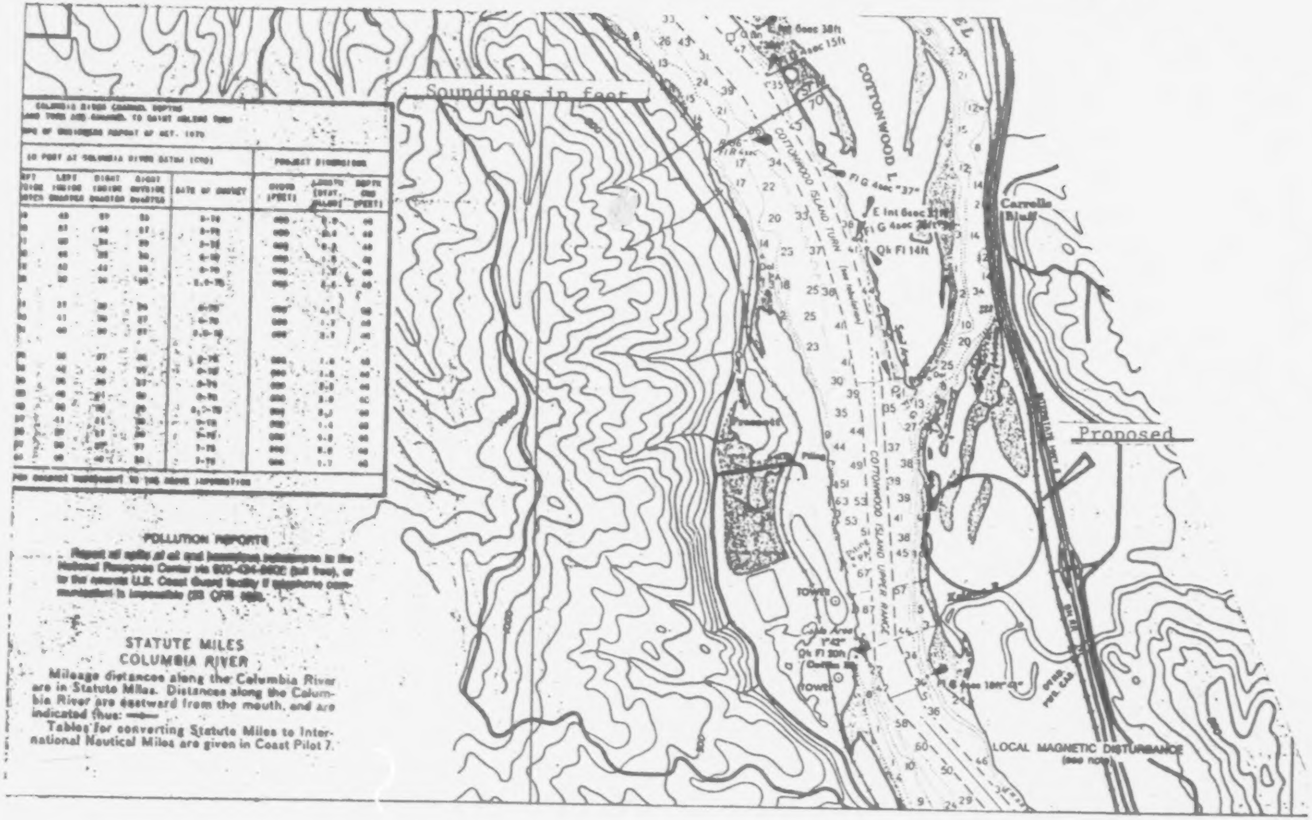
Environmental/Permit Issues:

Environmental treatment is described in detail in project EIS. Air and water quality, noise, visual, and impacts on wildlife are all discussed. No significant impacts anticipated.

John Fratt
Manager
Port of Kalama
P.O. Box 47
Kalama, WA 98625
(206) 673-2325

Figure 4.32

Kalama Terminal Site


Soundings in feet
COTTONWOOD L
COTTONWOOD ISLAND TURN
COTTONWOOD ISLAND UPPER RANGE
Carrolls Bluff
Proposed
INTERSTATE HWY 5
Qk Fl 14ft
E Int 6sec
F G 4sec "37"
Piling
TOWER
Cable Area
LOCAL MAGNETIC DISTURBANCE (see note)
POLLUTION REPORTS
STATUTE MILES
COLUMBIA RIVER
Mileage distances along the Columbia River are in Statute Miles. Distances along the Columbia River are eastward from the mouth, and are indicated thus:
Tables for converting Statute Miles to International Nautical Miles are given in Coast Pilot 7.

18. Longview, Washington

Property Owner: Private
(owners can be contacted through Port Longview)

Plans/Schedule:

None announced. Port Longview acting as intermediary until definitive proposals are requested from bona fide interests.

Site Characteristics:

Size	325 acres
Water Frontage	6,000 feet
Water Depth	channel - 40 feet existing alongside - 25 feet existing - 40 feet planned tidal range - 3-5 feet

Present Use: Agricultural and grazing.

Dredging:

Alongside to match channel depth 150 feet distant. See general Columbia River discussion for potential channel deepening.

Rail Service:

One mile to Longview Switching Company connecting with Union Pacific/Burlington Northern mainline 12 miles away.

Environmental/Permit Issues:

- Air quality nonattainment area relative to particulates.
- Possible concern over effect of structures and operations on fish runs.

C.D. Pease
Manager of Marketing
Port of Longview
P.O. Box 1258
Longview, WA 98632
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TWX 910-473-8615

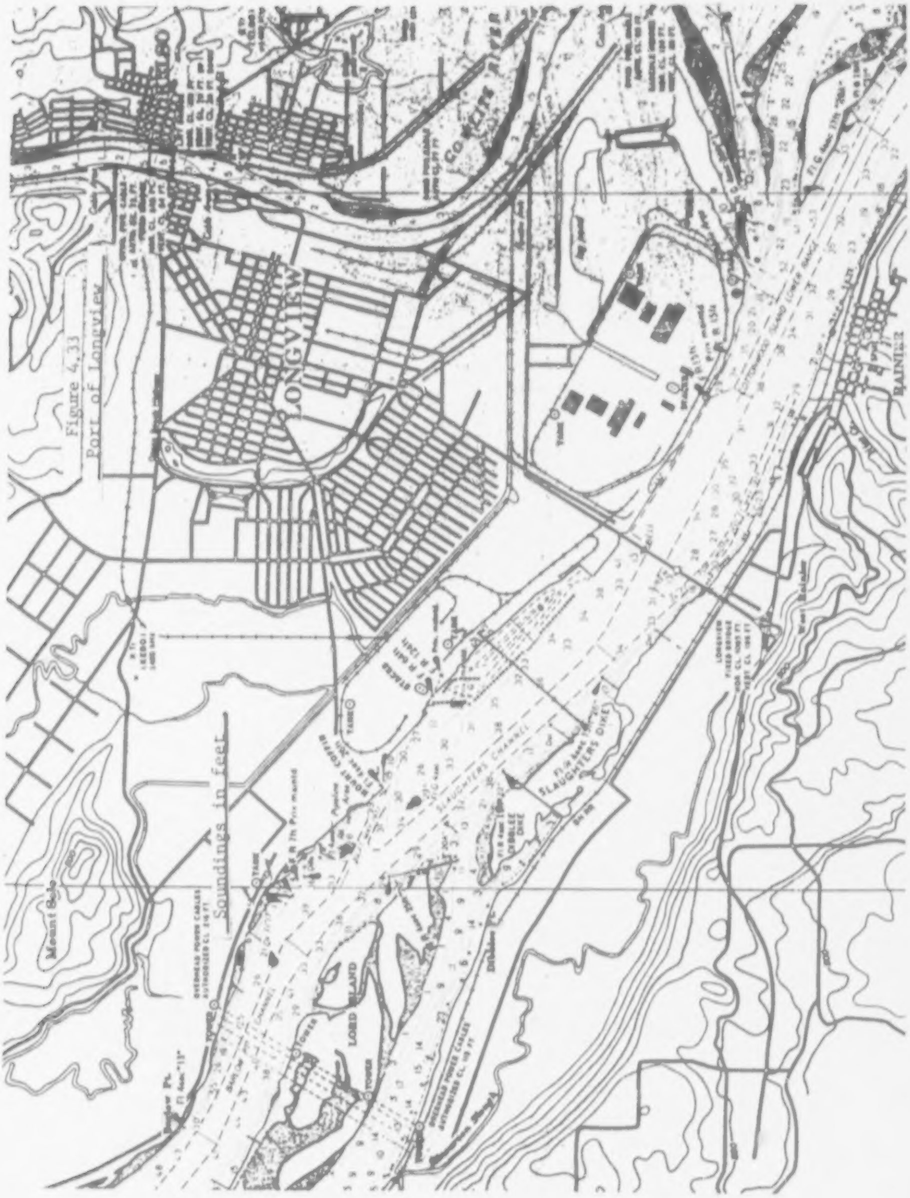

Figure 4.33
Port of Longview

Soundings in feet

Puget Sound, General

The Corps of Engineers presents the following information concerning existing and potential water depth in Puget Sound.

Vessels using federal projects at Everett, Seattle, Tacoma, and Olympia harbors and private sites at Steilacoom, Dupont, and Marysville (Tulalip) would enter Puget Sound. These salt water harbors are capable of providing offshore anchorage for the largest freighters and bulk carriers envisioned in the future due to the natural depths in the Sound (exceeding 200 feet in many locations). (Many ports have sufficient depth so Corps' dredging is not required.) Corps participation in channel dredging for coal exports from Puget Sound ports is considered unlikely.

There is likewise little potential for any future Corps work at Anacortes due to the activities involved. Any improvements would more likely be concerned with the construction of dock facilities by private interests which would be located in natural deep water areas.

19. Bellingham, Washington (Cherry Point)

Property Owner: Private
(owners can be contacted through Port of Bellingham)

Plans/Schedule:

The Bellcoal Group, a consortium of Glacier Park Company and ARCO Coal Company, undertaking a one year environmental and socioeconomic feasibility study of a dry bulk export terminal.

Site Characteristics:

Size	1,000 acres
Water Frontage	2,500 feet
Water Depth	alongside - 60+ feet existing mean tidal range - 5.5 feet

Present Use: Vacant.

Dredging:

None required. See general Puget Sound discussion.

Rail Service:

Burlington Northern 500 feet from site. Mainline six miles distant.

Environmental/Permit Issues:

Environmental impacts now being evaluated.

Thomas J. Glenn
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P.O. Box 1737
Bellingham, WA 98227
(206) 676-2500

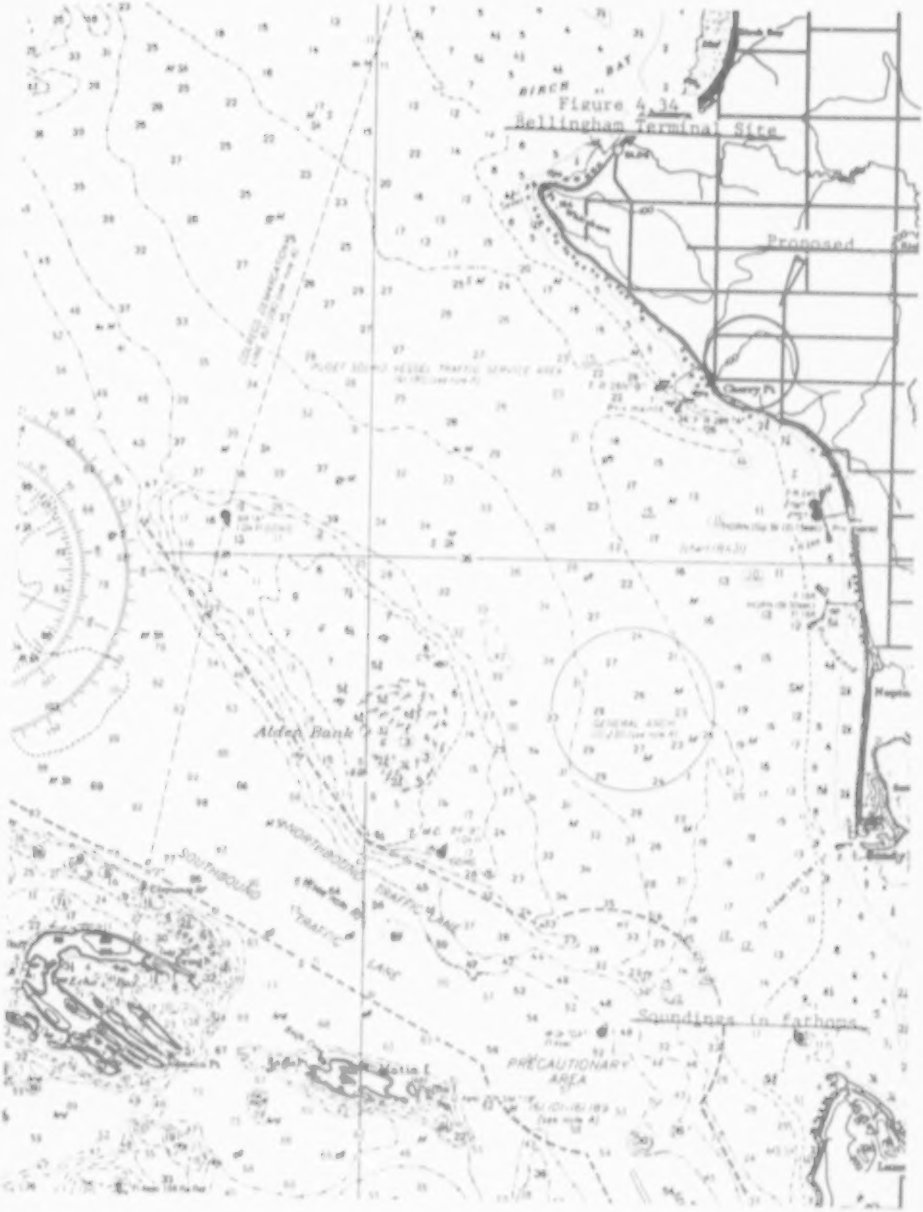

Figure 4.34
Bellingham Terminal Site

20. Anacortes, Washington

The Anacortes Port District reports that it is a potential location for coal terminal development but that no site-specific information is yet available. No plans or development schedule have been announced. The port is located on deepwater as described in the general Corps' discussion and offers the closest potential Puget Sound site to the open ocean. Vessels of unlimited size can be accommodated. Rail service to Anacortes is by a 16 mile Burlington Northern branch line.

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Port of Anacortes
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Anacortes, WA 98221
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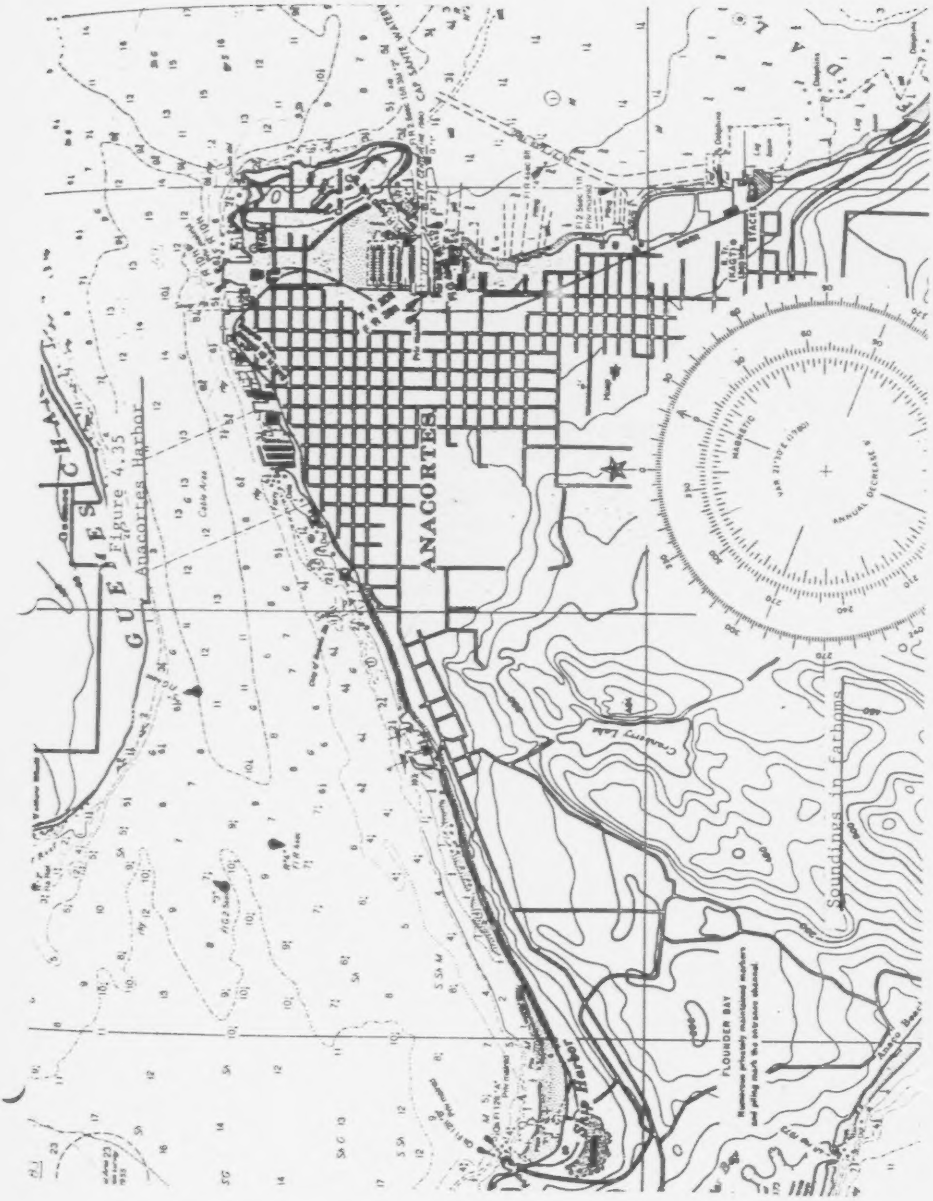

Figure 4.35
Anacortes Harbor

Soundings in fathoms

21. Tulalip, Washington
(35 miles north of Seattle)

Property Owner: Tulalip Tribes

Plans:

Three-stage development up to 45 million tons per year (15 million annual tons and 1.5 million tons storage each stage). Vessels over 100,000 DWT to be accommodated.

Schedule:

Feasibility study now under way. Development and operating corporation being formed.

1981-83	approvals and permits
1983-85	construction
late 1985/ early 1986	start-up

Site Characteristics:

Size	1,300 acres
Water Frontage	1,400 feet (stage 1) 2,900 feet (stage 2)
Water Depth	alongside 80-90 feet
Present Use:	Industrial, forestry, and fisheries.

Dredging:

None required.

Rail Service:

2.5 miles to Burlington Northern mainline. Tribes own siding right-of-way. Two lightly-used grade crossings.

Environmental/Permit Issues:

No significant impacts reported. Tribes have total land use jurisdiction to mean lower low water.

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Tulalip Tribes
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Del Moss
Project Manager
Tulalip Coal Export Terminal
6700 Totem Beach Rd.
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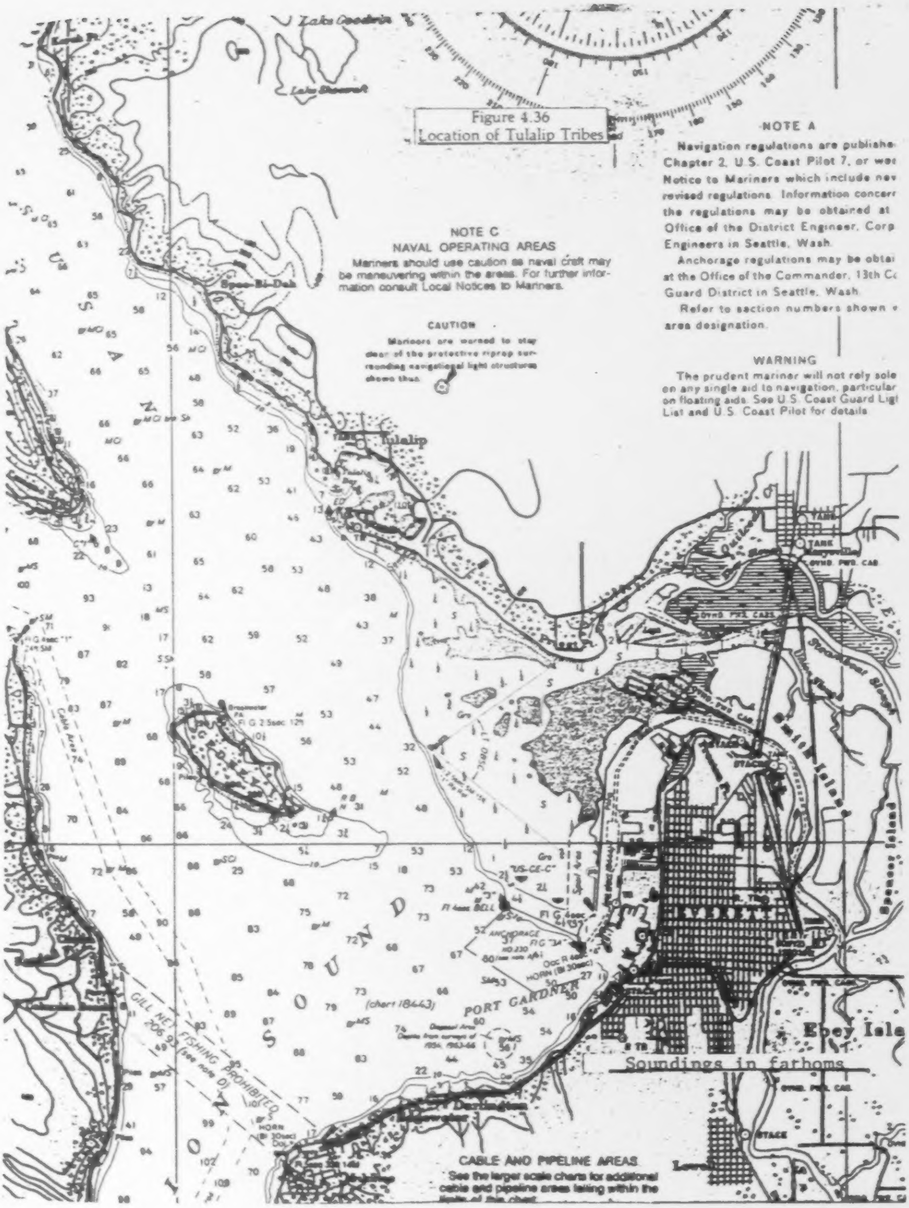

Figure 4.36
Location of Tulalip Tribes

NOTE A

Navigation regulations are publishe Chapter 2, U.S. Coast Pilot 7, or wee Notice to Mariners which include nev revised regulations. Information concerr the regulations may be obtained at Office of the District Engineer, Corp Engineers in Seattle, Wash.

Anchorage regulations may be obtai at the Office of the Commander, 13th Cc Guard District in Seattle, Wash.

Refer to section numbers shown area designation.

NOTE C
NAVAL OPERATING AREAS

Mariners should use caution as naval craft may be maneuvering within the areas. For further information consult Local Notices to Mariners.

CAUTION

Mariners are warned to stay clear of the protective riprap surrounding navigational light structures shown thus.

WARNING

The prudent mariner will not rely sole on any single aid to navigation, particular on floating aids. See U.S. Coast Guard Ligl List and U.S. Coast Pilot for details.

CABLE AND PIPELINE AREAS

See the larger scale charts for additional cable and pipeline areas falling within the limits of this chart.

22. Everett, Washington

Property Owner: Port of Everett

Plans/Schedule:

None announced. Development would occur on tidelands to be filled on Jetty Island.

Site Characteristics:

Size	up to 1,800 acres (230 upland, 1,570 tidelands)
Water Frontage	dependent on configuration
Water Depth	alongside up to 100 feet

Present Use: Vacant tidelands and beach.

Dredging:

Dependent on terminal size. Primary purpose to acquire fill.

Rail Service:

Bridge to site required. Then 1,200 yards to switching tracks, two miles to Burlington Northern mainline.

Environmental/Permit Issues:

Site is on wetlands and would need filling.

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Port of Everett
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(206) 259-3164

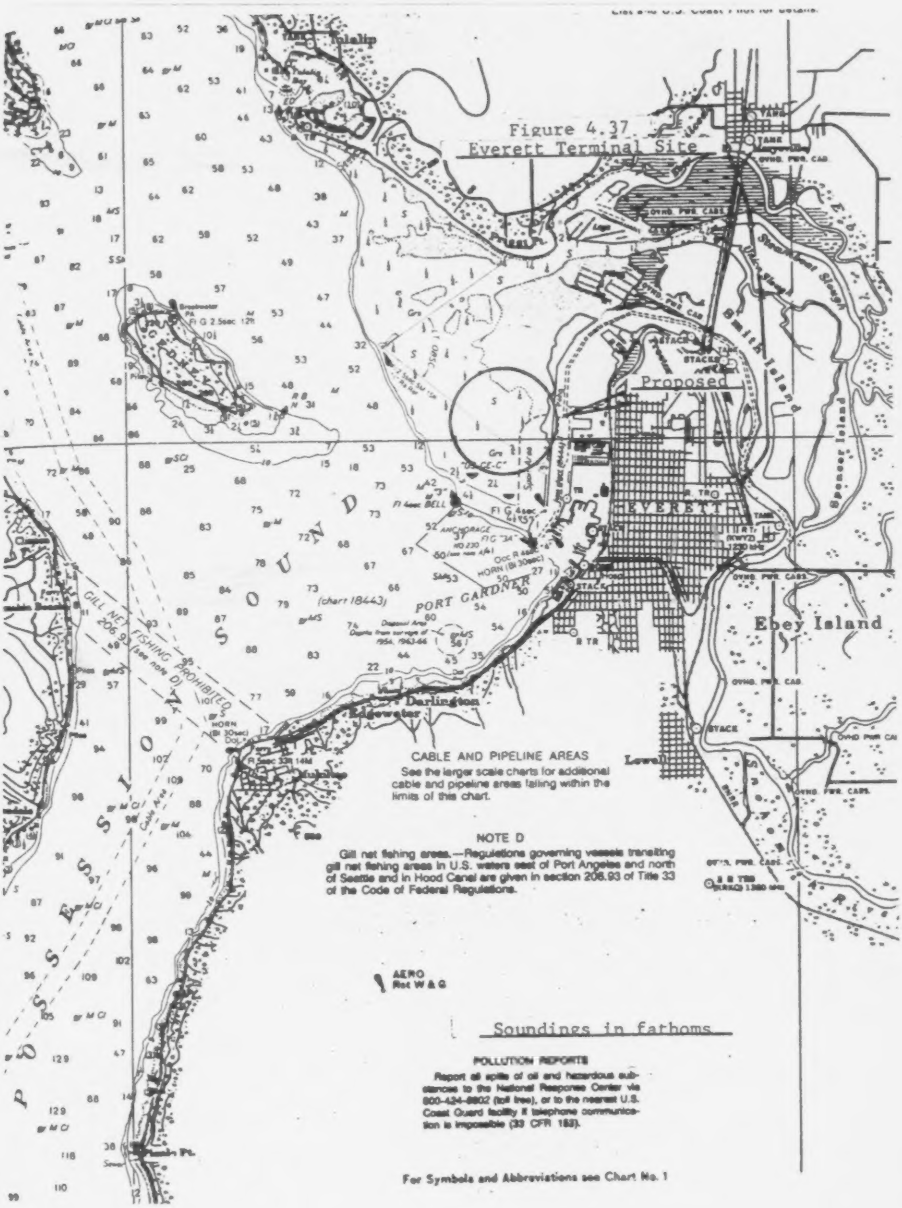

Figure 4.37
Everett Terminal Site

Soundings in fathoms

Tulalip
Priest Pt.
Proposed
Smith Island
Steamboat Slough
Spencer Island
EVERETT
Ebey Island
Lowell
PORT GARDNER
(chart 18443)
ANCHORAGE
SOUND
POSSESSION
GILL NET FISHING PROHIBITED
206.93 (see note D)
Darlington
Edgewater
Mukilteo
OVHD. PWR. CABS.
STACK
CABLE AND PIPELINE AREAS
See the larger scale charts for additional cable and pipeline areas falling within the limits of this chart.
NOTE D
Gill net fishing areas.—Regulations governing vessels transiting gill net fishing areas in U.S. waters east of Port Angeles and north of Seattle and in Hood Canal are given in section 206.93 of Title 33 of the Code of Federal Regulations.
AERO
Rot W & G
POLLUTION REPORTS
Report all spills of oil and hazardous substances to the National Response Center via 800-424-8802 (toll free), or to the nearest U.S. Coast Guard facility if telephone communication is impossible (33 CFR 153).
For Symbols and Abbreviations see Chart No. 1

23. Tacoma, Washington

Property Owner: Port of Tacoma

Plans/Schedule:

None announced. (Investigating deepwater terminal supplied from ground storage by 8,000 foot conveyor).

Site Characteristics:

Size	90 acres storage
Water Frontage	1,200 feet (8,000 feet from storage)
Water Depth	alongside - 70 feet planned mean tidal range - 11 feet

Present Use: Vacant.

Dredging: Minimal required.

Rail Service:

Union Pacific/Burlington Northern mainline adjacent to site.

Environmental/Permit Issues:

- Air quality nonattainment area for particulates.
- Potential impact on nearby Indian fishing grounds.

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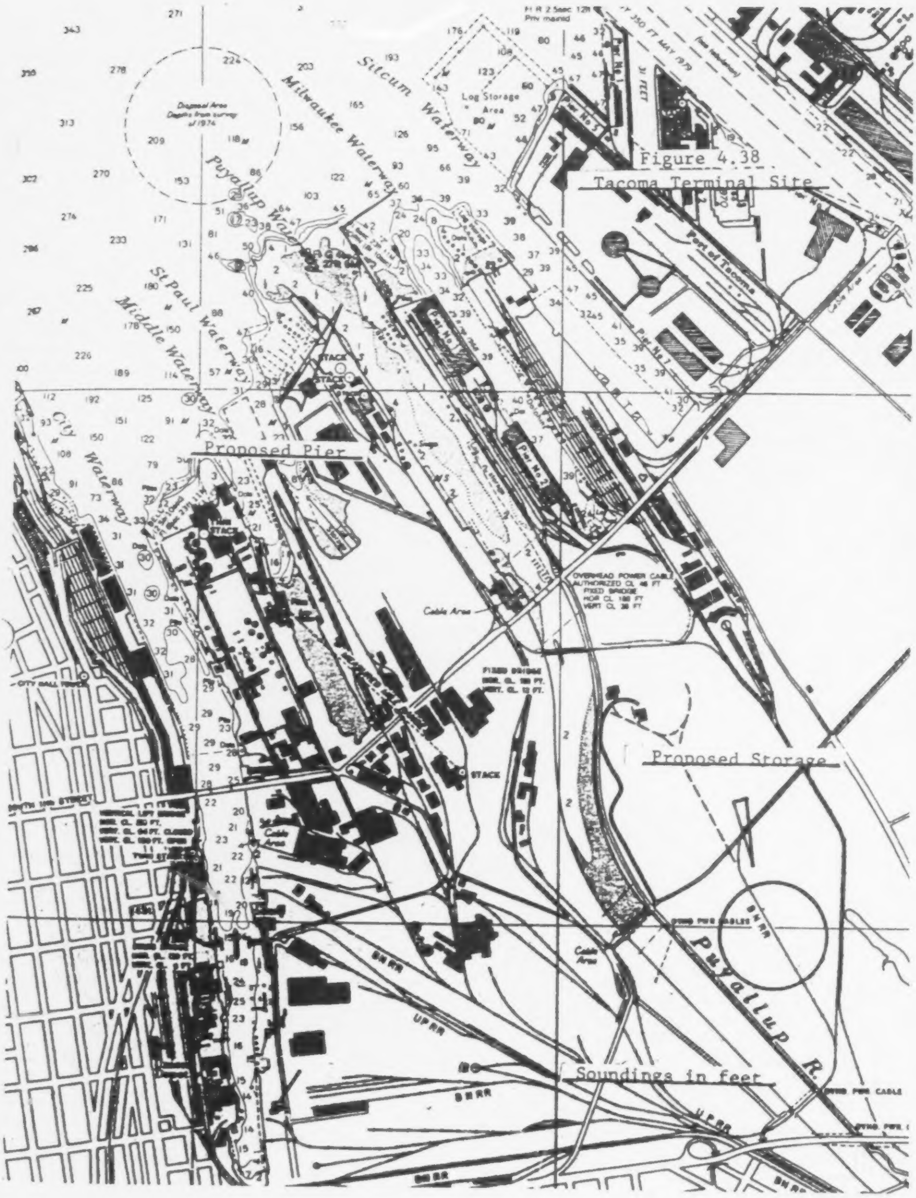

Figure 4.38

Tacoma Terminal Site

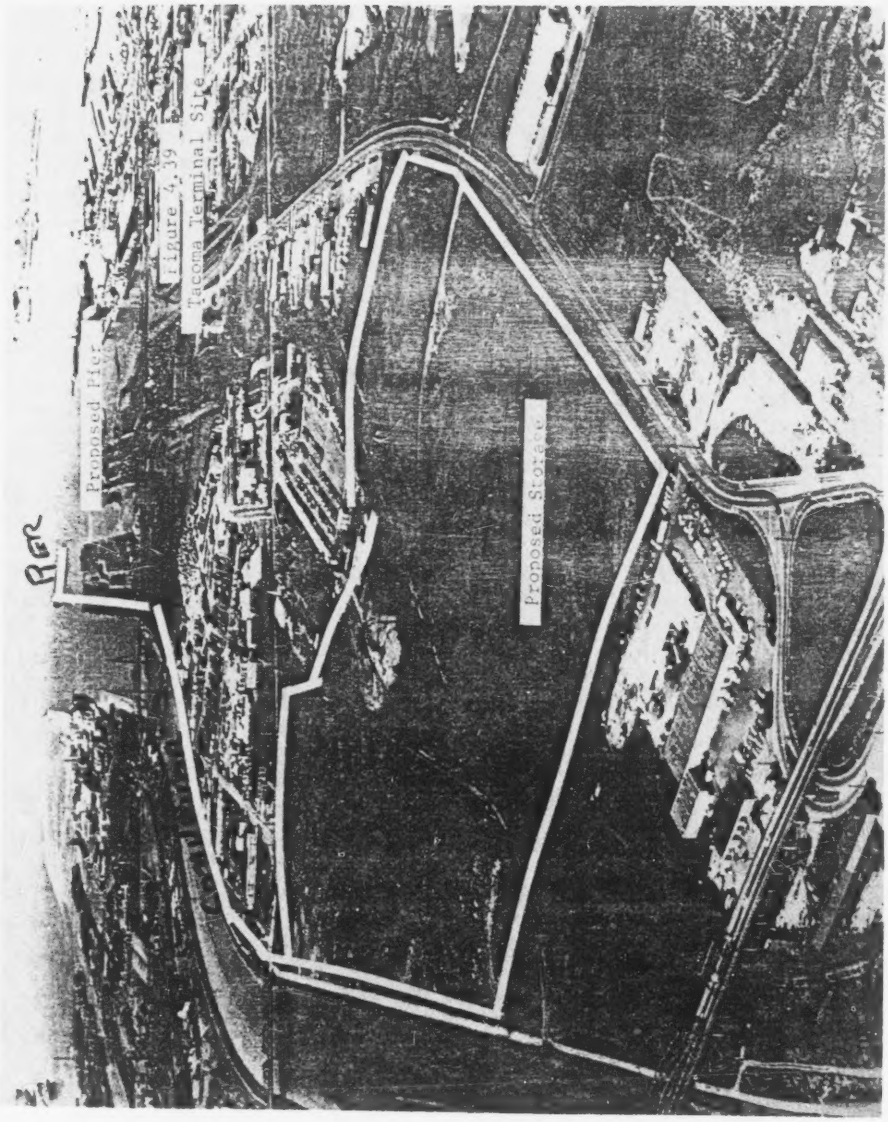

Figure 4.39
Tacoma Terminal Site

24. West Tacoma, Washington

Property Owner: Lone Star Industries, Inc.

Plans:

Investigating development of a terminal with potential throughput capacity up to 15 million tons per year. Ground storage up to 1.5 million tons. Vessels of unlimited size to be accommodated. Annual throughput and participants not finally determined.

Schedule:

Preliminary, independent feasibility study concluded; more detailed investigation underway. Discussion continuing with coal producers and users. No development schedule announced.

Site Characteristics:

Size	100+ acres (of 400+ acre total)
Water Frontage	1.125 miles
Water Depth	100 feet existing within 400 feet of shore mean tidal range - 9.3 feet
Present Use:	Sand and gravel mining, processing, storage and distribution by rail, barge and truck.
Dredging:	None required.

Rail Service:

Double mainline track of Burlington Northern and Union Pacific railroads pass through site.

Environmental/Permit Issues:

No significant impacts reported. Because of location, past excavations and existing screening, neither proposed storage area nor loading ships would be visible from adjacent areas. Attainment area for air quality.

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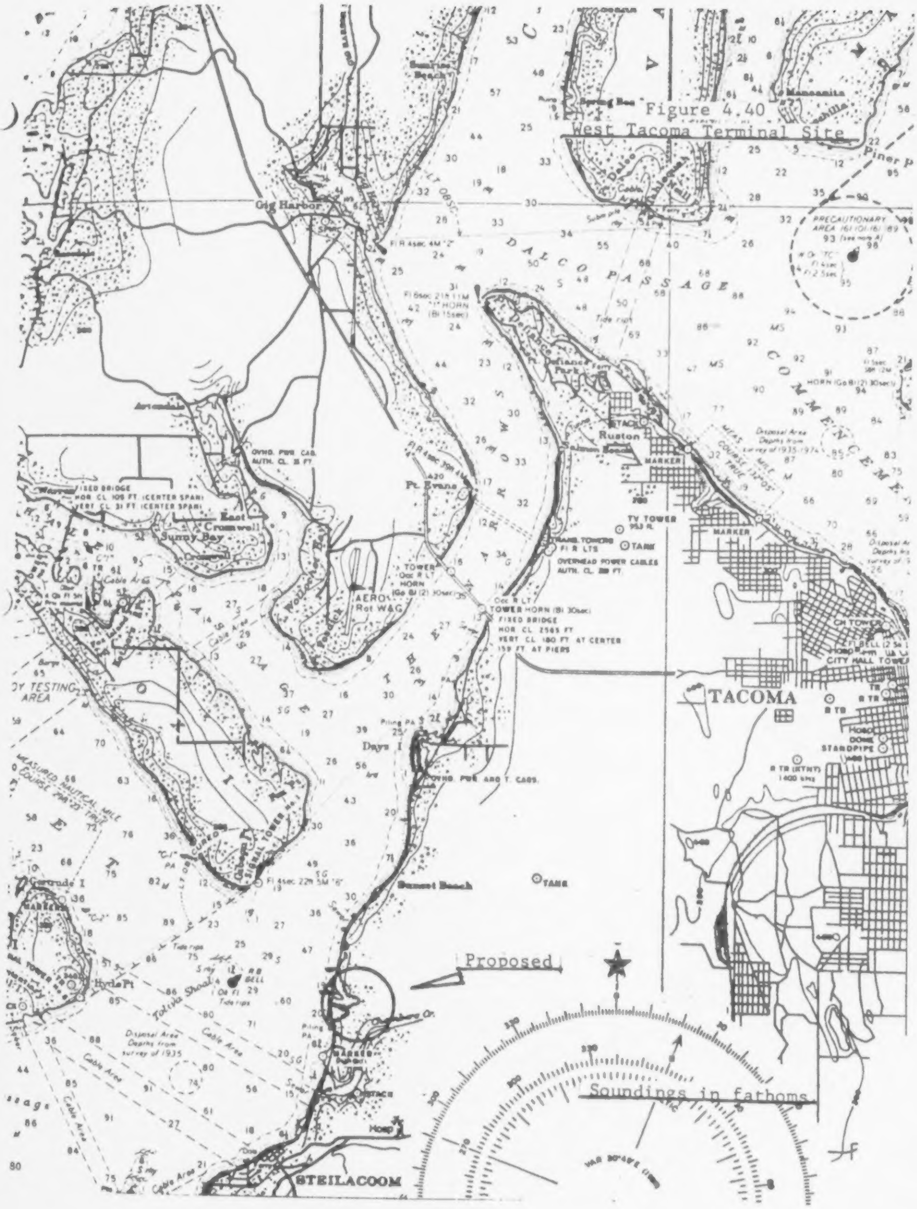

Figure 4.40
West Tacoma Terminal Site

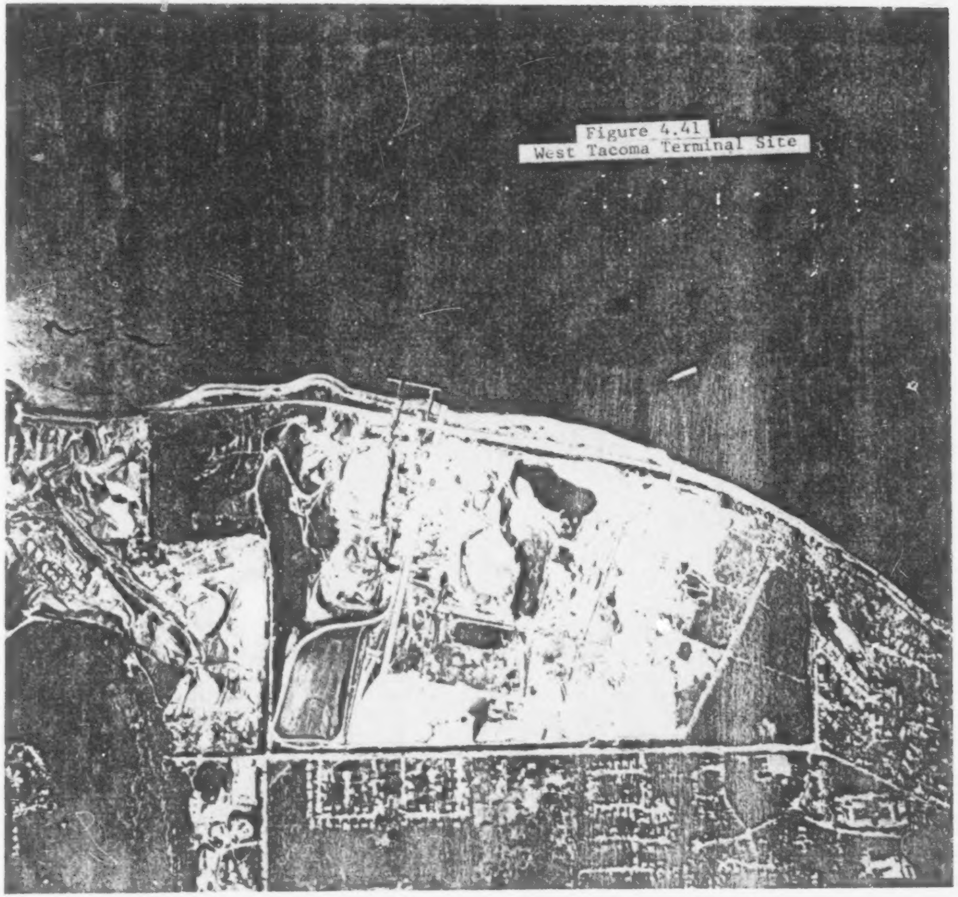

Figure 4.41
West Tacoma Terminal Site

25. Dupont, Washington

The Weyerhaeuser Company has performed a preliminary evaluation of a portion of its vacant Dupont property for coal terminal development. No decision, plans, or schedules have been announced. Weyerhaeuser reports that the 3,200-acre southern Puget Sound parcel has 60 to 100 feet of water depth and is served by both the Union Pacific and Burlington Northern railroads.

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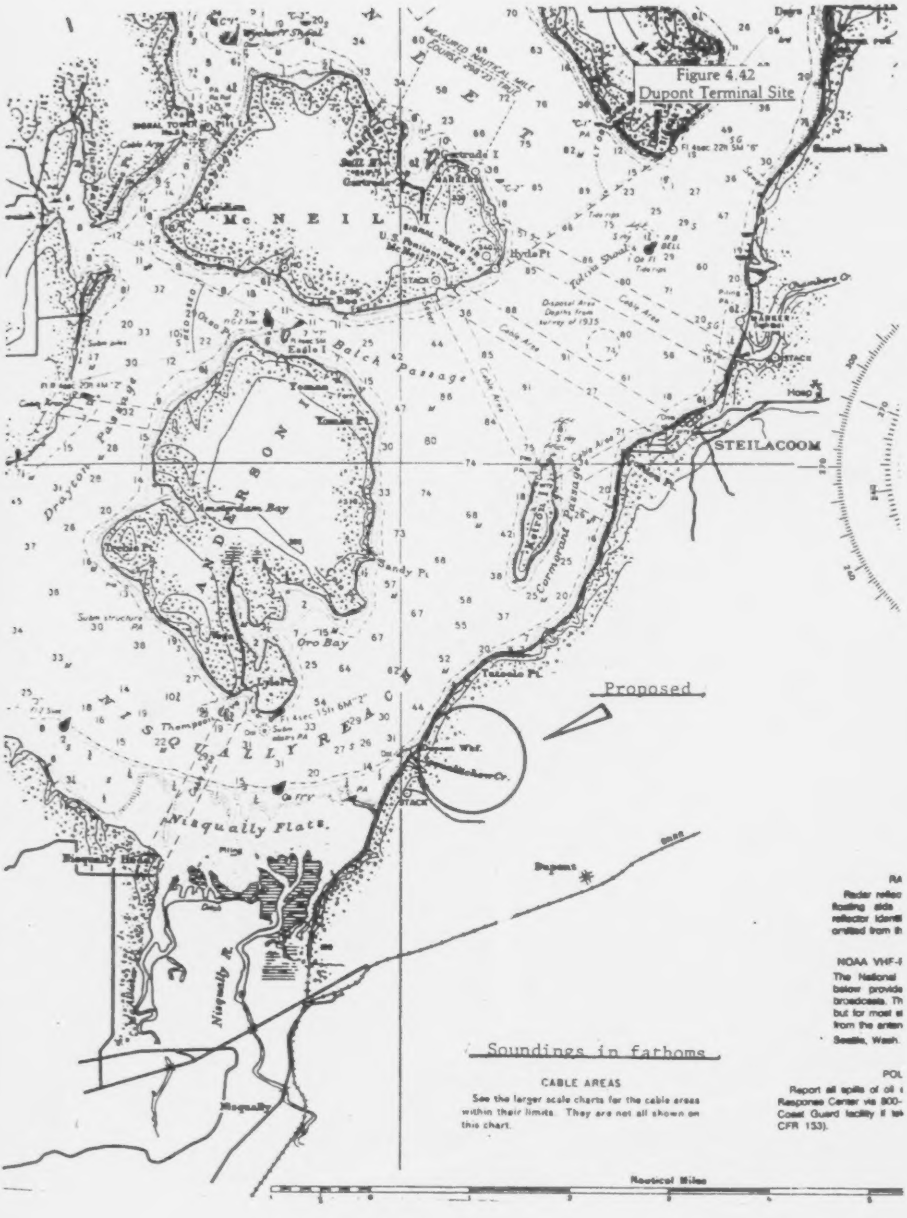

Figure 4.42
Dupont Terminal Site

26. Seward, Alaska

Property Owner:	City of Seward (leased to Torkelson-Kellogg, Inc.)
Plans/Schedule:	None announced.

Site Characteristics:

Size	100 acres
Water Depth	50 - 100 feet within 100 yards of shore
Present Use:	Vacant.
Dredging:	None required.

Rail Service:

Six mile spur required to connect with terminus of The Alaska Railroad (owned by U.S. Department of Transportation).

Environmental/Permit Issues:

Corps of Engineers permit in hand for development of adjacent industrial park and deepwater port. Impacts of coal terminal construction now being evaluated.

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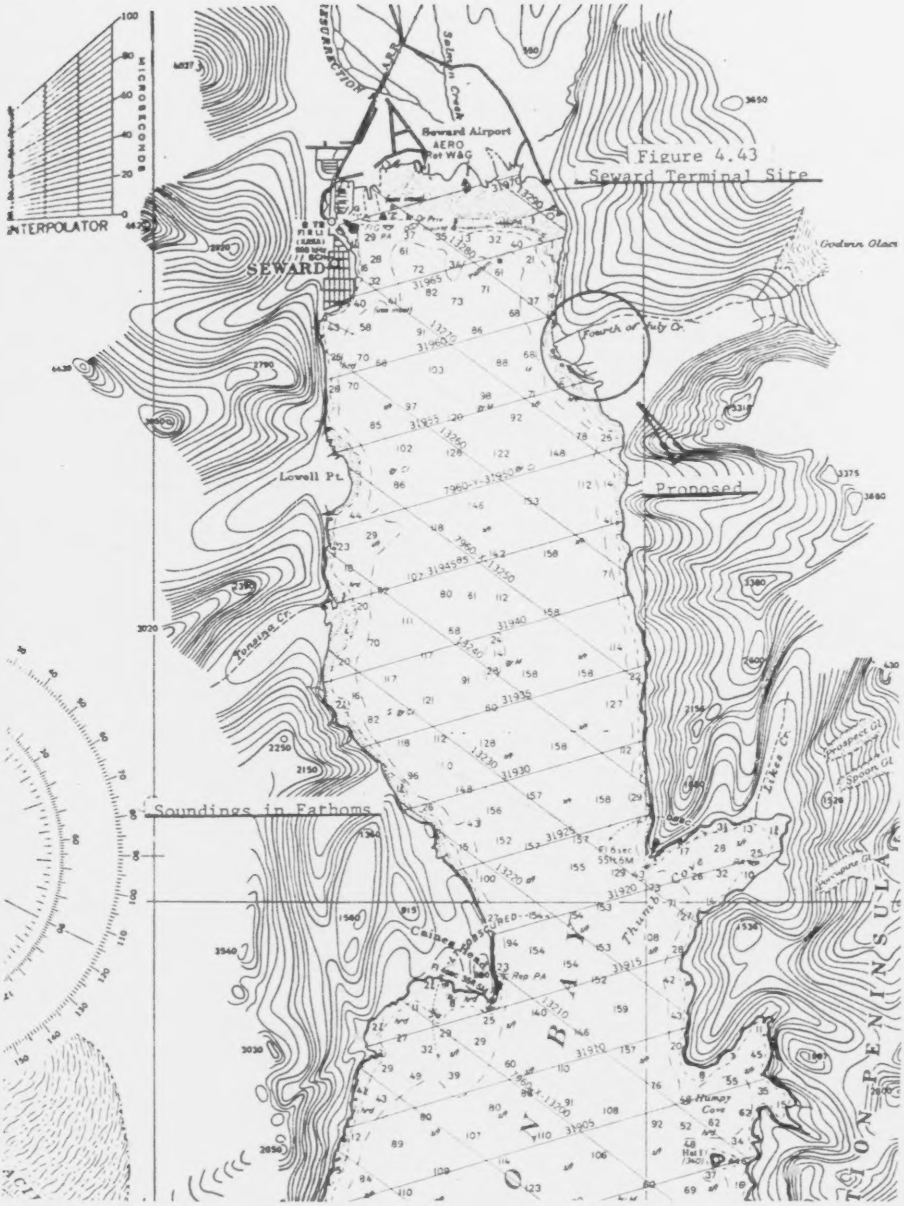


Figure 4.43
Seward Terminal Site

Chapter 5

OCEAN TRANSPORTATION

A. Existing World Fleet

Few vessels are built specifically to carry ocean-borne coal. The greatest part of international coal shipments is carried by bulk carriers and combination vessels. Bulk carriers are those vessels especially suitable for the transportation of a variety of dry bulk commodities, such as coal, grain, ore, bauxite and phosphates. Bulk/oil combination vessels are capable of carrying either crude oil and petroleum products in liquid form or coal and other dry bulk commodities. Bulk/oil combination vessels are also called combined carriers or OBO's (oil-bulk-ore). This section presents the characteristics of the existing bulk and bulk/oil world fleet. Typical dimensions of bulk carriers are shown in Figure 5.1.

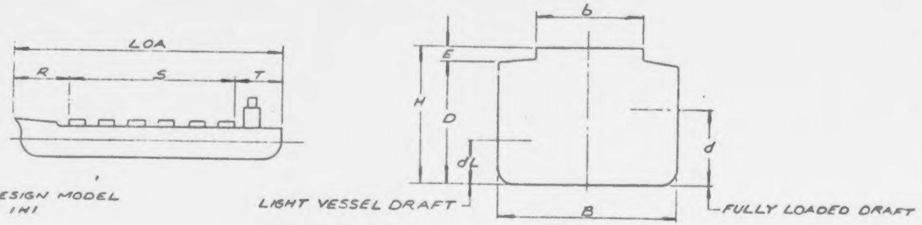
Based on the "Bulk Fleet Register" of 1980, Figure 5.2 presents the number of bulkers and combination vessels in various size categories. Since the economics of ocean transport dictate that long distance shipments be of the largest feasible size, most observers assume that U.S. coal will generally not move abroad in vessels of less than 40,000 deadweight tons (DWT).* This would mean that some

---

* The deadweight tonnage (DWT) of a ship is the difference between the load displacement and the lightweight. The latter is comprised of the steel and propelling machinery. Therefore, the total deadweight includes the cargo, fuel, food, water, stores, provisions, passengers, crew, and baggage. By far the largest component of deadweight in a bulk carrier is the cargo, and so the deadweight of a ship will be assumed to closely approximate the cargo-carrying capacity of the ship.

Figure 5.1

Dimensions of Typical Bulk Carriers



NOTE: BASED ON DESIGN MODEL SHIPS FROM IHI

VESSEL DATA

	DWT	12,500	16,000	20,000	25,000	32,000	40,000	50,000	60,000	80,000	100,000	125000	160,000	200,000	250,000
	LOA	130.0 / 426.5	150.0 / 492.0	170.0 / 557.7	180.0 / 590.5	190.0 / 623.3	210.0 / 689.0	230.0 / 754.6	240.0 / 787.4	250.0 / 820.2	260.0 / 853.0	280.0 / 918.6	300.0 / 930.2	300.0 / 984.2	335.0 / 1099.0
	R	13.0 / 42.6	15.0 / 49.2	17.0 / 55.8	18.0 / 59.0	19.0 / 62.3	21.0 / 68.9	23.0 / 75.5	24.0 / 78.7	25.0 / 82.0	26.0 / 85.3	28.0 / 91.8	30.0 / 98.4	30.0 / 98.4	35.0 / 114.8
	S	94.0 / 308.4	108.0 / 354.3	122.0 / 400.2	130.0 / 426.5	136.0 / 446.2	150.0 / 492.0	160.0 / 524.9	172.0 / 564.3	180.0 / 590.5	186.0 / 610.2	200.0 / 656.2	215.0 / 705.4	215.0 / 705.4	222.0 / 727.6
	T	23.0 / 75.5	27.0 / 88.6	31.0 / 101.7	32.0 / 105.0	35.0 / 114.8	39.0 / 128.0	41.0 / 134.5	44.0 / 144.3	45.0 / 147.6	48.0 / 157.5	52.0 / 170.6	55.0 / 180.4	55.0 / 180.4	60.0 / 196.8
	B	20.2 / 66.3	21.8 / 71.5	23.2 / 76.1	25.0 / 82.0	27.0 / 88.6	29.2 / 95.8	31.8 / 104.3	34.6 / 113.5	37.4 / 122.7	40.4 / 132.5	42.0 / 137.8	45.0 / 147.6	50.0 / 164.0	56.0 / 183.7
O/B/O	b	9.4 / 30.8	9.8 / 32.1	10.2 / 33.5	10.6 / 34.8	11.4 / 37.4	12.2 / 40.0	13.2 / 43.3	14.8 / 48.5	16.5 / 54.1	18.8 / 61.7	19.4 / 63.6	20.0 / 65.6	22.4 / 73.5	25.0 / 82.0
O/O	b	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	9.0 / 29.5	12.4 / 40.7	12.6 / 41.3	14.0 / 45.9	14.0 / 45.9
	D	11.3 / 37.0	12.2 / 40.0	13.5 / 44.3	14.4 / 47.2	15.5 / 50.8	16.9 / 55.4	18.0 / 59.0	18.9 / 62.0	19.6 / 64.3	20.4 / 66.9	22.0 / 72.1	24.0 / 78.7	26.0 / 85.3	28.0 / 91.9
	E	1.4 / 4.6	1.4 / 4.6	1.6 / 5.2	1.6 / 5.2	1.6 / 5.2	1.6 / 5.2	1.8 / 5.9	1.8 / 5.9	2.0 / 6.6	2.0 / 6.6	2.5 / 8.2	3.0 / 9.8	3.5 / 11.5	3.5 / 11.5
	H	12.7 / 41.7	13.6 / 44.6	15.1 / 49.5	16.0 / 52.5	17.1 / 56.1	18.5 / 60.7	19.8 / 65.0	20.7 / 67.9	21.6 / 70.9	22.4 / 73.5	24.5 / 80.4	27.0 / 88.6	29.5 / 96.8	31.5 / 103.3
	d	8.1 / 26.6	8.5 / 27.9	9.2 / 30.2	9.7 / 31.8	10.4 / 34.1	11.2 / 36.7	12.0 / 39.4	12.7 / 41.7	13.2 / 43.3	14.0 / 45.9	15.0 / 49.2	16.5 / 54.1	20.0 / 65.6	20.0 / 65.6
	dL	2.7 / 8.8	2.8 / 9.2	3.1 / 10.2	3.2 / 10.5	3.5 / 11.5	3.7 / 12.1	4.0 / 13.1	4.2 / 13.8	4.4 / 14.4	4.7 / 15.4	5.0 / 16.4	5.5 / 18.0	6.7 / 22.0	6.7 / 22.0
NORMAL BALLASTED DRAFT								6.0 / 19.7	6.5 / 21.3	7.0 / 23.0	8.0 / 26.2	8.0 / 26.2	8.0 / 26.2	10.0 / 32.8	11.0 / 36.0

ALL DIMENSIONS IN METERS —⧄— IN FEET

SOROS ASSOCIATES

VESSEL DATA

Figure 5.2

WORLD DRY BULK FLEET

(By Size)

Size Group (DWT)		Number	% of Total Fleet (Number)	Total DWT	% of Total Fleet (Tonnage)
10-19,999	B	1,151	28.7	18,363,983	14.2
	B/O	2	0.9	29,886	0.1
		1,153	27.3	18,393,869	12.1
20-29,999	B	1,354	33.8	34,172,754	26.5
	B/O				
		1,354	32.0	34,172,754	22.5
30-39,999	B	669	16.7	23,244,281	18.0
	B/O	1	0.1	30,360	0.1
		670	15.8	23,274,641	15.4
40-59,999	B	481	12.0	23,639,326	18.3
	B/O	19	8.7	999,676	4.4
		500	11.8	24,639,002	16.3
60-79,999	B	231	5.8	15,650,805	12.1
	B/O	49	22.4	3,552,448	15.8
		280	6.6	19,203,253	12.7
80-99,999	B	21	0.5	1,758,203	1.4
	B/O	30	13.7	2,709,869	12.0
		51	1.2	4,468,072	2.9
100-149,999	B	99	2.5	11,761,650	9.1
	B/O	80	36.5	9,122,065	40.6
		179	4.2	20,883,715	13.8
150+	B	3	0.1	468,940	0.4
	B/O	38	17.4	6,051,109	26.9
		41	1.0	6,520,049	4.3
TOTAL	B	4,009	100.0	129,059,942	100.0
	B/O	219	100.0	22,495,413	100.0
		4,228	100.0	151,555,355	100.0

Source: Compiled from the Bulk Carrier Register 1980 (London, England: H. Clarkson & Co. Ltd., 1980)

B: Bulk Carriers

B/O: Bulk/Oil Combinations

75 percent of the world's dry bulk fleet is excluded from the American coal export market.

Smaller vessels, while numerically superior, represent only fifty percent of the bulk fleet's total tonnage. Over 75 million deadweight tons (DWT) capacity is potentially available for oceanic coal transport in larger ship sizes. This tonnage, of course, must service not only American coal but also other coal exporters and is also in demand to transport other dry bulk commodities.

Figure 5.3 identifies the nations with the world's ten largest registered bulk fleets. The United States ranks sixth in total number of bulkers, but due to the number of small "lakers" (ships that service the Great Lakes trade), it is ninth in average vessel size.

At present, the absence of a large U.S. flag bulk carrier fleet is of little significance for the export of U.S. coal. Since the bulk shipping business is open and unrestricted, ships of any nation can be chartered.

Two political/administrative measures, however, may someday alter the open nature of bulk shipping. The United Nations Committee on Trade and Development (UNCTAD), has recently worked out a cargo preference system for the scheduled liner trades wherein an equal percentage of cargoes would be reserved for fleets of the importing and exporting nations, with only a small proportion available for third flag carriers. It is expected that this convention will soon be ratified by enough nations to take effect, and some would like to extend its provisions to bulk carriers. Although the code is intended to benefit third world fleets, if implemented, it would require additional American flag vessels to move the forecasted U.S. coal export tonnages.

In considering extension of the code to the bulk trades, the impact of the more costly American

Figure 5.3

WORLD DRY BULK CAPACITY

(BY FLAG)

FLAG	BULK CARRIERS					BULK/OIL COMBINATIONS				
	Number Ships	% World Fleet	Total Tonnage	% World Fleet	Average DWT	Number Ships	% World Fleet	Total Tonnage	% World Fleet	Average DWT
Liberia	772	19.3	27,840,829	21.6	36,063	73	33.3	7,407,649	32.9	101,475
Greece	724	18.1	21,148,947	16.4	29,211	27	12.3	2,302,400	10.2	85,274
Japan	347	8.7	11,584,261	9.0	33,384	7	3.2	1,038,795	4.6	148,399
Panama	332	8.3	7,954,912	6.2	23,961	5	2.3	551,700	2.5	110,340
United Kingdom	219	5.5	9,239,896	7.2	42,191	31	14.2	3,789,146	16.8	122,231
United States	148	3.7	2,928,598	2.3	19,788	2	0.9	164,319	0.7	82,160
Norway	118	2.9	6,197,081	4.8	52,518	24	11.0	2,260,053	10.0	94,169
Canada	109	2.7	2,510,908	1.9	23,036	-0-	-	-0-	-	-0-
Italy	92	2.3	3,392,167	2.6	36,871	14	6.4	1,362,418	6.1	97,316
India	92	2.3	3,116,423	2.4	33,874	10	4.6	1,138,591	5.1	113,859
Other	1056	26.3	33,145,920	25.7	31,388	26	11.9	2,480,342	11.0	95,398
Total World Fleet	4009	100.1*	129,059,942	100.1*	32,193	219	100.1*	22,495,413	99.9*	102,719

Source: Compiled from the Bulk Carrier Register 1980 (London, England: H. Clarkson & Company Ltd., 1980) shipping on the delivered cost of U.S. coal will have to be examined. Such a consideration, however, is not expected in the near term, if at all.

The second potential regulatory impact on open vessel registration is that resulting from "head of the line" privileges for U.S. flag vessels at U.S. coal ports. Federal legislation enacted in 1980 granted such rights to U.S. ships engaged in U.S. trade. However, this has evoked little attention, since domestic coal shipments out of export terminals are thusfar minimal.

Of greater potential effect, however, are proposals by industry, especially labor representatives, that similar priority be granted to U.S. flags engaged in the export coal market. As long as lengthy loading delays and high demurrage charges continue at east coast ports, this could be a substantial benefit which may outweigh the more costly aspects of using American vessels. By 1985, however, when west coast loading facilities come on line, delays should be minimal, so that the proposed priorities should prove less significant. In any event, the issue has already generated concerned comments by some coal importers using other fleets.

B. Vessel Costs

1. Introduction

An analysis of vessel costs is an essential component of a meaningful discussion of the future coal trade from western United States ports. Since coal has a relatively low value per unit weight, savings in transportation costs are a significant consideration for buyers when they choose a source of supply. Even though the cost of ocean transportation is relatively low in comparison to other modes of bulk transportation such as rail, the marine portion of coal delivery still adds between 20 and 35 percent to the cost of U.S. coal, based on its value at the export port. Consequently, both exporters and importers try to control the costs of ocean transportation, and these costs are significant in contractual negotiations and in the establishment of trade routes.

This section examines the costs incurred by ship operators and the freight rates charged to exporters and importers. Shipping costs will first be described in a general way to present the perspective of ship owners and shipping companies. Then the freight rates charged to exporters and importers will be examined.

It is important to maintain the distinction between costs incurred during ship operations, and the freight rates charged to those who use shipping services. When vessel operating expenses exceed the freight rate, ships are transferred to a more lucrative trade, removed from the active fleet, or operated at a loss.

Since coal exports from the western U.S. have consisted of relatively small shipments to date, rates for large tonnages are not available. Nonetheless, the shipping market is global, and sufficient data are available on coal movement in general to provide a benchmark for ocean shipping from the western U.S.

2. Operating Expenses and Capital Costs

Ship operators incur several types of expenses. These include capital outlays for ships; debt service; crew wages; insurance coverage on the hull, cargo and crew; fuel costs; port charges; canal costs; maintenance and repair expenses; stores and provisions; company overhead; and so on. All of these costs are subject to inflation, and some, such as fuel costs, have been rising much faster than the rate of inflation.

Figure 5.4 illustrates the trend in the relative contributions of capital, operating, and bunker (fuel) costs. The sharp rise in bunker costs is having a widespread impact on shipbuilding and ship operating practices. Since fuel efficiency is dependent on velocity, some ships are now travelling at reduced speeds to reduce fuel expenses.

Figure 5.4

Vessel Costs for a 60,000 DWT Bulker

(Costs Based on Hampton Roads/Europe Trading)

Percentage Contribution to Total Cost

Year	Capital	Operating	Bunker	Total
1973	42	45	13	100
1977	35	35	30	100
1980	29	35	36	100

Source: David G. Giles, "Development of Ports and Ship Sizes in the Coal Trade," paper presented to the Coal Summit 1981, New York, N.Y., June 10-11, 1981. (Available from Simpson, Spencer & Young, London.)

The average daily cost of operating a vessel depends on many factors. A partial list of these factors includes the following:

1. Ship characteristics: e.g., age, cargo capacity, service speed, and fuel consumption.

2. Owner policies: e.g., crewing levels, crew nationality, and maintenance and repair policies.

3. Contingencies: e.g., repairs and delays.

4. Insurance: e.g., claims record of company.

Figure 5.5 presents operating costs reported in early 1981 by the Maritime Administration for some typical foreign-flag vessels. At present, most coal exports from the U.S. are carried in foreign-flag vessels. A new ship, commissioned in 1981, is assumed in developing the information in Figure 5.5.

Figure 5.5

Average Daily Cost of
Foreign-Flag Dry Bulk Vessels

Type of Cost	Vessel Size (DWT)		
	60,000	100,000	150,000
Daily capital cost	$10,300	$13,977	$18,229
Daily fuel cost (steaming at sea)	17,400	21,900	24,300
Daily vessel expenses	3,900	4,623	5,233
TOTAL	$31,600	$40,500	$47,762
Daily cost per DWT	$0.527	$0.405	$0.318

Source: James A. Lisnyk, "The Ocean Shipping of Coal", paper presented at the Coal and Ports Seminar, American Association of Port Authorities (AAPA), Mobile, Alabama, February 16 - 19, 1981.

Figure 5.5 also shows the economies of scale (in daily cost per deadweight ton) that can be realized by using larger ships. These economies underlie the trend toward using larger ships in the coal trade. A more complete discussion of the factors that affect the use of various ship sizes is provided in a later section.

By making some assumptions, the information in Figure 5.5 can be used to calculate the approximate round-trip voyage costs per ton of cargo for various vessel sizes engaged in a hypothetical coal trade from the west coast of the U.S. For comparison, costs from eastern U.S. and Gulf Coast origins are also presented. The costs, shown in Figure 5.6, are based on the following assumptions:

1. average vessel speed of 15 knots
2. five days total port time for loading and unloading (no fuel expense for this period)
3. two days for weather delays
4. two days for contingencies
5. port charges (pilots, tugs, etc.) are $20,000 at each end for 60,000 DWT vessels, $25,000 for 100,000 DWT vessels, and $30,000 for 150,000 DWT vessels
6. one day for Panama Canal transit, with charges of $75,000 for two-way transit of a 60,000 DWT ship
7. foreign flag vessels
8. return voyage undertaken with empty holds ("in ballast")
9. sample west coast origins include Puget Sound (Bellingham), Columbia River (Portland), northern California (San Francisco), and southern California (Los Angeles)

Figure 5.6 is only illustrative since the various cost components continually vary. It is also important to differentiate vessel costs to the owner from rates charged to the charterer.

Figure 5.6 does show, however, economies of scale that can be realized by using larger ships, and economies to be realized by Pacific Rim buyers utilizing west coast, as opposed to east coast, ports.

Figure 5.6

Average Round-Trip Vessel Cost Per Cargo Ton
U.S. to Yokohama

	Voyage Duration (Days)	Vessel Size, (1,000 DWT)		
		60	100	150
Puget Sound	32.6	$16.39	$12.61	$ 9.97
Columbia River*	33	$18.11	--	--
Northern California**	34.2	$17.23	$13.26	--
Southern California	36	$18.18	$13.99	$11.05
New Orleans***	62	$33.12	--	--
Hampton Roads***	64	$34.17	--	--

(*) The largest grain shipments from the Columbia River ports have been in vessels loaded with approximately 55,000 tons. Therefore, daily costs for a 60,000 DWT ship are allocated to only 55,000 tons of cargo.

(**) Draft restrictions at the San Francisco Bar limit Bay Area shipping to 100,000 to 125,000 DWT.

(***) Panama Canal limits shipments to approximately 60,000 tons.

3. Effect of Subsidies

Before proceeding to a discussion of charter rates, a few comments on the cost differential between U.S. flag and foreign-flag ships should be made.

U.S.-built and U.S.-manned ships are more costly than their foreign counterparts. The difference between U.S. and foreign costs is due, in part, to the higher U.S. standard-of-living reflected in wage scales and material costs and to higher shipbuilding productivity in foreign shipyards. Another component of the cost difference is attributable to the direct and indirect assistance provided by foreign governments to their own maritime industries. The differences between U.S. and foreign costs for a typical 35,000 DWT dry-bulk ship are shown in Figure 5.7.

Figure 5.7

Impact of U.S. Subsidies on U.S. Flag Competitiveness

	1980 Cost to U.S. Operator Without Gov't. Subsidy	Cost to U.S. Operator With Max. Gov't. Subsidy	Cost to Foreign Operator
Cost of New Ship	$50,100,000	$25,050,000	$23,800,000
Annual Operating Cost	$ 4,100,000	$ 2,200,000	$ 2,100,000

Source: The Ocean Shipping of Coal, Maritime Administration, 1981.

Figure 5.7 shows that even with shipbuilding and ship operating subsidies, costs to a U.S. ship operator are higher than costs to a foreign ship operator. The same relative difference exists with larger ships. For example, the U.S. Maritime Administration (MARAD) estimates that a 60,000 DWT ship has a U.S. capital cost (unsubsidized) of $65,000,000, a U.S. subsidized price of $32,500,000, and a foreign capital cost of around $30,000,000. Clearly, the availability of U.S. and foreign subsidies have dramatic effects on the costs incurred by a ship operator. At this point, government policies on ship subsidies are under review in the U.S. and several foreign nations. The level of direct government assistance for shipping in the future, then, is unclear, but will probably diminish in the U.S.

4. The Shipping Marketplace

Rates paid by a customer for shipping services can be quite different from the costs incurred in performing the service. In general, rates reflect the global supply of available shipping capacity and demand for shipping services. Shipowners are numerous and geographically dispersed. Within limits set by the design of the individual ship, the vessels can operate throughout the world and shift from one type of trade to another, depending on which trade will produce the largest profit for the owner. The market is facilitated by ship brokers, and considerable price competition exists.

Many factors can influence the availability of shipping capacity. These factors include the current size of the fleet, the number of combined carriers which are serving the dry bulk trade and can switch quickly from liquid to dry cargoes, the rate of ship scrappings and new buildings, the transfer of ships from inactivity to active service, and so on. Demand for shipping services usually reflects the pace of commercial activity in a commodity.

5. Charter Arrangements

The various charter arrangements include: (1) single voyage contracts, (2) longer-term time charters, and (3) contracts of affreightment (COA).

Rates for single voyage contracts (the spot market) are highly volatile. In a single voyage charter, the charterer specifies the cargo, loading, and discharging points and when the vessel is to be available for loading. The American-Welsh Coal Charter party is the prevalent contractual document between the charterer (shipper/consignee) and the vessel owner (see Appendix I). In addition to numerous standard clauses, the charter party provides for negotiated terms. These include the time allowed for loading and discharging. The cost of loading and discharging is usually charged to the charterer or to the receiver of the cargo. The charter fixture is then called "F.I.O."--free in and out, for the owner. A common variation is "F.D."--free discharge; that is, the charterer is responsible for the cost of discharging the cargo. As much as five days laytime (loading and discharging time) is frequently provided at the loading port and five days at the discharge port. Beyond the laytime allotted in the charter party, demurrage is paid by the charterer to the ship owner. Demurrage is intended to compensate the owner for use of the ship beyond the agreed loading and discharging days. In theory, the demurrage rate is expected to cover daily capital and operating expenses when the ship is not employed. In practice, the demurrage rate reflects market conditions as does the freight rate. In a strong (owners') market the demurrage rate will exceed normal compensation levels, as in the coal trade currently. Dispatch is a bonus for the charterer (usually one-half of the agreed upon demurrage rate), which is deducted from the freight charges for days saved in loading and discharging. The specific language of the charter party is as follows:

> "If longer detained, Charterer to pay vessel demurrage of ______________ U.S. currency per day (or pro rate) for part thereof. If sooner dispatched, vessel to pay charterer or his agents ______________ U.S. currency per day (or pro rate for part thereof) dispatch money for laytime saved."

Under this arrangement, it is not the ship owner who bears the burden of the delays; it is the charterer and the end user. During the high demand period of the past eighteen months, demurrage has reportedly approached $900,000 per ship in Curtis Bay, Maryland (50 days x $18,000/day). This equates to $18/ton for a 50,000 DWT ship and exceeds the single voyage freight rate for ships destined for Europe.

As noted above, for many ship owners with ships waiting in the queue, the demurrage exceeds the expected return calculated in the freight rate. For example, the owner may be receiving $10,000 per day from the freight rate, which increases to $15,000 per day when the ship begins collecting demurrage. Because demurrage is not calculated in the charter rate, the charterer must carefully assess the loading port, the probable demurrage, and the total delivered costs, not just the freight rate.

Longer-term time charters, wherein the charterer obtains the use of a vessel for a specified period, such as one year, generally have more stable rates than voyage charters, because the ship owner is guaranteed employment for the ship for a longer period. Also, in a time charter, the charterer generally pays for fuel and port charges, whereas the ship owner generally absorbs most of these costs in a voyage charter.

In a time charter, the matter of who assumes various costs, such as the costs of loading and discharging, is often negotiated, and when the demand for ships is high, the charterer usually bears the expenses.

Contracts of Affreightment (COA) can provide a means to lower transport costs. With a COA, the freight contract will normally cover all or a specified amount of tonnage that is proposed to be shipped in a given trade, over an agreed period, and at a fixed rate per ton. The COA allows the ship owner to carry other cargoes and substitute vessels. For this flexibility, the owner generally agrees to a lower freight rate than in a voyage charter agreement.

Coal shippers prefer long-term arrangements whereby the desired shipping capacity can be planned well in advance at freight levels based on long-term costs. Over 90 percent of the oceanborne coal trade is carried by vessels operating under long-term time charters, affreightment contracts, or direct ownership by coal shippers (although much U.S. export coal has recently been carried on vessels operating on single voyage charters). Long-term pricing trends are routinely foreshadowed first in the spot market, however, even though it accounts for only a small percentage of the sales on a given day.

6. Factors Affecting Freight Rates

Freight rates are negotiated between the shipper and the ship owner/operator. Many factors influence the freight rate, and they include the following:

1. ship type
2. vessel operating expenses
3. vessel characteristics such as cargo capacity
4. market conditions
5. voyage origin and destination, and whether additional loading and discharge stops are to be made
6. country of registry
7. crew nationality
8. who pays certain expenses, such as loading and discharge fees, port fees, canal fees, trimming, supplemental insurance, and so on
9. laytime allotment, and whether Sundays and holidays are considered in calculating laytime
10. options on additional cargo to be carried
11. loading and discharge rates
12. loading and sailing dates

Consequently freight rate negotiations are usually conducted in consideration of the specific features of a particular ship and voyage. In the following discussion, more general trends underlying freight rate fluctuations are presented.

It was the erratic behavior of the single-voyage market in the first place which helped bring about the heavy proportion of long-term shipping arrangements. The long-term shipping arrangements, however, now limit available supply and act to further intensify short-run freight rate fluctuations, thereby creating a destabilizing influence on spot coal rates.

Short-run changes in the demand for oil are another destabilizing influence. Although bulk carriers do not carry oil, a change in the demand for oil transportation causes coal-carrying combination vessels to shift into and out of the oil trade, thereby altering the tonnage supply schedule and significantly affecting freight rates for coal. In 1973, dry-bulk shipments utilized only 19 percent of the world combination fleet. As a consequence of the 1973 oil crisis and resultant reduction in demand for tankers, the utilization of the combination fleet in the dry-cargo trades rose dramatically. As more combination carriers entered the dry-bulk trades, the supply of dry-bulk carriers grew, causing spot-voyage freight rates for coal to fall. It is true that, under certain circumstances, the shift effect of the combination vessels tends to add a measure of elasticity to the supply of coal-carrying vessels. But, as combination vessels currently represent, by tonnage, 37 percent of the dry bulk carrier fleet, while representing only 15 percent of the much larger oil fleet, their overall effect is, on balance, decidedly destabilizing to coal and other bulk cargoes' single-voyage freight rates.

Another factor affecting shipping rates is the availability of a cargo to be transported on the return leg of a journey. If a suitable "backhaul" cargo can be found, the fixed voyage costs are spread over a greater total tonnage of cargo transported, resulting in a lower vessel operating cost per ton of cargo which can be passed on to a shipper in the form of reduced freight rates.

In general, there is very little bulk cargo, either dry or liquid, moving eastbound across the Pacific. Two exceptions are alumina from Australia and crude oil from various Indonesian and Arabian Gulf ports. Alumina is imported primarily in Panamax vessels at a rate of 800,000 to 1,000,000 tons per year. Most of this tonnage is covered by long term contracts at a rate of about $10.00 per long ton FIO. Depending on market conditions and the status of existing contracts, alumina or oil backhaul cargoes could reduce the freight rate for coal exports from the west coast.

7. Historical Patterns in Charter Rates

It was established above that freight rates are negotiated quantities reflecting many specific features that pertain to a particular ship and voyage. Nonetheless, a few organizations publish freight rate indices for frequently-travelled routes that are based on recent activity in the charter markets. These indices can be in slight disagreement because they are based on different data and assumptions.

Because the indices reflect chartering activity of the existing fleet, they cannot be compared directly to the ship running cost figures for representative new ships presented in Section 5.2. For example, the existing fleet consists of ships widely distributed in age and the ownership costs will average less than those assumed in Section 5.2.

Trends in voyage rates (one way) and time charter rates with durations of one year are shown in Figure 5.8. The period when spot rates were rising the fastest is graphically shown in Figure 5.9.

Figure 5.8

Historic Freight Rates for Coal Shipments

(55,000 DWT Dry Bulk Carrier)

Year	Single Voyage Rate Hampton Roads to Japan $/ton of Coal	Time Charter Rate One Year $/day (x 1000)
1979 (average)	14.80	8.4
1980 (average)	24.20	12.6
1980 - February	17.50	11.2
March	21.00	11.2
April	24.50	11.2
May	26.50	12.2
June	24.50	12.3
July	22.00	13.2
August	25.00	13.2
September	25.50	13.8
October	29.00	13.8
November	29.50	13.8
December	29.00	13.8
1981 - January	28.50	12.8
February	28.00	13.0

Source: Lloyd's Shipping Economist.

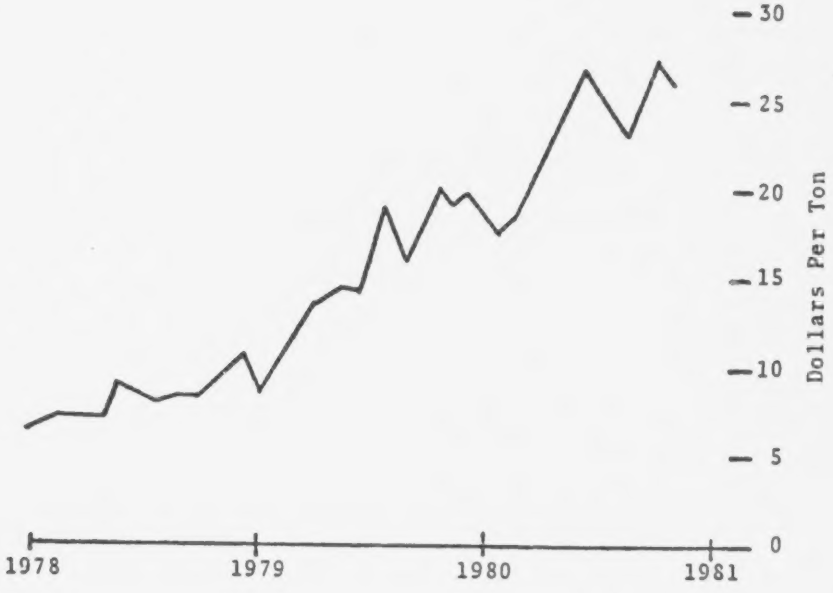
Note: This figure presents historic price trends for two different type of charters. Due to their differing characters and components, however, the single voyage and time charter rates cannot be directly compared to establish relative per/ton costs.

Figure 5.9

Single Voyage Charter Rates

Panamax Ship

Hampton Roads - Japan



These data show a rapid rise in freight rates since 1978. This escalation in rates was caused by several factors, including an increase in the amounts of coal shipped and port congestion. Port congestion results in a reduction in the supply of shipping capacity, since ships are waiting in line rather than transporting cargo. The plateau in freight rates reached at the end of 1980 was caused in large measure by anxiety over the coal miners' strike in the U.S. In early 1981, this strike dampened demand for bulk carriers. Since early 1981, single voyage freight rates have continued to fall.

Given a sustained growth in the coal trade, there are several ways in which supply and demand can be brought into closer harmony so that freight rates are reduced. One option is to build additional port facilities so that the existing fleet is utilized more efficiently. Another is to build more ships.

C. Near-Term Additions to the Coal-Carrying Fleet

1. Introduction

After a slump in the late 1970's, shipbuilding orders have been on the rise. Figure 5.10 compares the orders for several different types of ships. The ship types most in demand are those capable of transporting dry bulk materials, since they account for 44% of the world orderbook.

Figure 5.10

Percentage Distribution of

World Newbuilding Orderbook Among Ship Types

Ship Type	% of Total Orderbook (gross tons)
Ore and bulk carriers	38.9
Bulk/Oil carriers	5.1
Oil tankers	28.4
Container ships	2.8
General cargo	6.6
Specialized carriers	9.9
Others	8.3
TOTAL	100.0

The world orderbook for the dry bulk fleet as of April 1, 1981, is shown on Figure 5.11.

Figure 5.11

SIZE DISTRIBUTION OF WORLD DRY BULK FLEET ON ORDER AS OF APRIL 1, 1981

(By Size)

Size Group (DWT)		Number	% of Total Fleet (Number)	Total DWT (X 1000)	% of Total Fleet (Tonnage)
10-19,999	B	13	3.7	204.9	1.1
	B/O	-	-	-	-
20-29-999	B	68	19.3	1747.3	9.4
	B/O	-	-	-	-
30-39,999	B	97	27.6	3404.3	18.4
	B/O	-	-	-	-
40-59,999	B	36	10.2	1744.1	9.4
	B/O	4	1.1	220.0	1.2
60-79,999	B	91	25.9	5963.0	32.2
	B/O	8	2.3	592.5	3.2
80-99,999	B	4	1.1	496.4	2.7
	B/O	2	0.6	268.0	1.4
100-149,999	B	25	7.1	3216.4	17.4
	B/O	-	-	-	-
150+	B	4	1.1	680.9	3.7
	B/O	-	-	-	-
TOTAL	B	338	96.0	17,457.3	94.3
	B/O	14	4.0	1,080.5	5.8
		352	100.0	18,537.8	100.1*

Source: *Marine Engineering/Log 1981 Yearbook*. New York, N.Y.: Simmons-Boardman Publishing Corp., 1981.

B: Bulk Carriers

B/O: Bulk/Oil Combinations

* Does not add to 100 due to rounding.

The cargo capacity of bulk carriers on order is quite large (see Figure 5.11) and represents over 12% of the cargo-carrying capacity of the existing world dry bulk and combination carrier fleet.

Those countries with shipyards that have orders for the most ship tonnages are shown in Figure 5.12.

Figure 5.12

Shipbuilding Countries With Orders
For the Most New Tonnages

Shipyard Location	% of World Dry Bulk and Combination Carrier Fleet on Order (by DWT)
Japan	37.3%
Brazil	9.9%
Korea	8.3%
Spain	5.7%
China, Republic of	5.3%
Belgium	4.7%
All Others	28.8%
TOTAL	100.0%

Source: Marine Engineering/Log 1980 Yearbook. New York, N.Y.: Simmons-Boardman Publishing Corp., 1980.

Japanese shipyards have contracts for more than three times the deadweight tonnage of new ships as either of its nearest competitors, Brazil and Korea. Among other advantages, Japanese shipyards are pioneers in the use of computers and industrial robots in ship design, construction, welding and painting, and benefit from the depreciation of the yen against the dollar.

2. Factors Influencing Selection of Ship Size

Many factors affect the choice of ship size when ordering new ships. On the one hand are the economies of scale in using large ships. Larger ships cost less to construct and to operate per ton of cargo capacity. These economies, however, are not as significant over short hauls, especially if the design capacity of these ships is not used. In summary, the disadvantages of a larger ship are as follows:

- Higher capital investment.
- Greater insurance, maintenance, and repair costs.
- Higher port fees.
- Inaccessibility of some ports. The only existing major coal-loading facilities for ships of 100,000 DWT and over are located in Western Canada, Australia, and South Africa. Discharging terminals accessible to carriers in excess of 100,000 DWT exist in Western Europe and Japan, and more are planned. Nonetheless, many ports will continue to be inaccessible to large ships.
- Inability to pass through the Suez and Panama Canals. The draft and beam restrictions of the Panama Canal limit passage to ships of up to about 70,000 DWT. For this reason, ships in the 50,000-70,000 DWT range are commonly referred to as "Panamax" vessels. There are no plans at present for enlarging the Panama Canal.

  The Suez Canal is currently being expanded to accommodate fully laden ships of 125,000 DWT. Further expansion planned for the late 1980s may increase the limit to 150,000 DWT. Ships of this size can already pass through the Suez Canal in ballast.

Ships too large to pass through the canals must use the longer routes around the southern capes of South America and South Africa. Because of the greater voyage costs thereby incurred, it may be less costly on particular routes to use a smaller vessel that can pass through the canal, in spite of the higher daily cost per ton transported, including canal dues.

- Limited backhaul opportunities.

In other words, smaller vessels offer increased flexibility in the cargoes which can be transported and the ports served. These factors enhance the employment opportunities including backhaul available to a smaller vessel, thereby increasing its proportion of revenue-producing days.

3. Trend Toward the Use of Larger Ships

Despite all of the above, the trend is clearly toward use of larger ships. Figure 5.13 summarizes the distribution of new orders among size classes and compares that distribution to the size distribution of vessels which had been employed in the coal trade up to 1977.

Figure 5.13

Comparison of Size Distribution of New Building Orders For Bulkers With Vessels Already Employed In The Coal Trade

Size Class (DWT x 1000)	% of World Dry Bulk and Combination Carrier Fleet on Order (DWT)	Vessels Employed in the Coal Trade* (% of Cargo Carried)				
		1965	1970	1975	1976	1977
Less than 25	5.7%	63%	40%	29%	25%	23%
25 - 40	23.1	23	21	12	12	10
40 - 60	10.6	11	21	24	24	21
60 - 100	39.5	3	12	25	25	29
above 100	21.1	--	--	10	14	19

Sources: Marine Engineering Log 1980 Yearbook. Simmons-Boardman Publishing Corp. 1980. Bulk Systems International, July 1979.

* Columns may not add to 100% due to rounding and use of other vessel types.

As Figure 5.13 shows, the pattern in the coal trade has been towards the use of larger ships. On a ton-mile basis, H.P. Drewry Shipping Consultants has estimated that 55 percent of coal shipments were made in vessels of 50,000 DWT or larger towards the end of 1980. Fifteen years ago, these vessels accounted for less than five percent of the coal trade. The size distribution of ships on order reflects a continuation of this trend towards use of larger ships, especially in the 60,000 to 100,000 DWT range, and in ships above 100,000.

One projection to the year 2000 of the distribution of steam coal shipments among size classes of ships is presented in Figure 5.14.

Figure 5.14

Projected Distribution of Steam Coal Shipments

In Ton Miles, By Ship Size

(percent)

	Ship Size (thousand DWT)							
Year	20	20-35	35-50	50-80	80-100	100-150	150+	Total
1980	10	13	22	43	5	7	-	100
1985	6	7	19	39	4	17	8	100
1990	4	6	13	27	6	27	17	100
1995	3	5	10	24	6	30	22	100
2000	2	4	8	21	7	33	25	100

Source: H. P. Drewry Shipping Consultants Ltd., Changing Ship Type/Size Preferences in the Dry Bulk Market (London, England: HPD Publications): 1980.

Many observers predict that Panamax vessels will continue to maintain a strong market share, while the use of larger ships will increase as ports increase their ability to accommodate them. In the late 1980's, the larger ships could begin to capture a share of the market presently held by Panamax vessels, depending on the types of investments made in ports, railroads, and so on.

Almost all of the ships on order are scheduled for delivery by 1984, or prior to the time when large-scale terminals on the West Coast could be brought on line.

4. Other Near-Term Trends in the Future Fleet

Coal-fired ships are beginning to show up on the orderbook. In response to the sharp rise in oil prices, coal has been under study as an alternative fuel. At present, two Australian companies have on order four bulk carriers to be powered with coal. (Two of these four 75,000 DWT ships will be built in Italy and two in Japan.) These ships will be used in coastal trade along Australia, where fuel supplies will be readily available. However, availability of coal at ports is one present constraint to the use of coal-fired ships in international trade.

Ships can also become available for the transport of coal by conversion from other ship types. These conversions do not show up on the orderbook but could represent a significant addition to the dry bulk fleet. For example, a 77,800 DWT tanker was recently converted to a 84.800 DWT collier at a Japanese shipyard for a cost of $10 million. Depending on the fortunes of the tanker industry, many more tankers could be converted to serve the coal trade.

While combined carriers can alternate between the coal and oil trades, only a small portion of the orderbook for the dry bulk fleet consists of

OBOs. The capital cost of an OBO is larger than that of a comparable bulk carrier. The future significance of OBOs in the coal trade will depend on the relative freight rates in the oil and coal trades and the fortunes of oil shipping in general.

5. Near-Term Future Fleet

The capacity of the coal-carrying fleet does not appear to present a bottleneck to international coal trade in the near future. Indeed, some analysts are warning of a glut in bulk ships, because large tonnages in large sizes are scheduled for delivery before a corresponding increase in the level of trade. Coal-carrying tonnage can be added to the fleet by building new ships, by increasing the number of combined carriers that operate in the trade, by converting tankers to colliers, by deferring the scrapping of old ships, and by activating ships in storage. These factors respond to market conditions in a way that, in general, would increase the tonnages available to carry coal and moderate the pressure causing a rise in freight rates.

The lead time for delivery of a ship is one to two years. Major coal port development in the U.S. to date, has required more time. Therefore, barring restriction of shipyard production, shipping capacity can be increased more quickly than port capacity.

The composition of the future coal-carrying fleet remains in question. Ship owners continue to place orders for a range of ship sizes. The trend in size is upward but substantial numbers of ships of Panamax size and smaller are also on order. Smaller ships offer flexibility, while larger ships efficiently utilized provide economies of scale. However, these ships cannot be efficiently utilized without significant additional investment in terminal facilities.

D. Future Ocean Shipping Technologies

A number of technologies are presently under discussion that could have significant effects on the shipping of coal. The improvements that are materializing most quickly were initiated by the rapid escalation of oil prices. The need to control fuel costs produced the following responses:

- more fuel-efficient design of diesel propulsion systems, including the replacement of old engines with newer designs on some ships
- use of hull coatings to reduce friction
- development of waste heat recovery systems for ships
- development of slow speed propellers with suitably redesigned hulls
- discussion of a reduction in the design speed of new vessels to about 13 knots
- operation of ships at reduced velocities (slow steaming)
- discussion of alternative fuels, such as coal

About 40 years ago coal ceased to be the main form of marine power. The major drawbacks of coal were the superior handling characteristics of oil, the greater efficiency of diesel engines compared with existing steam engines, and the loss of cargo-carrying deadweight capacity to carriage of bunkers.

The oil price rises of the last eight years have transformed coal from a totally uneconomic marine fuel to one which offers the prospect of substantial cost savings and a potentially more secure and predictable cost/profit over the vessel's life. The problems of obtaining, storing, and handling coal may seem formidable to a generation of ship owners used to the convenience of oil, but recent design studies suggest that these problems can be mitigated without major increases in capital cost or manning levels. While some coal-fired ships have now appeared on the orderbook, the absence of widespread availability of coal bunkers is at present a constraint to the use of these ships in international trade.

Another development is the use of shallow-draft designs for bulk ships. A shallow draft design involves enlarging a ship by making it longer and wider rather than deeper. The resulting proportions alter the ship's relative proportions so that the length is approximately 5.5 times the beam and the beam is about 2.3 times the depth. In a conventional design, the length is about seven times the beam and the beam is about 1.8 times the depth. A comparison between conventional ship design and shallow draft design is illustrated in Figure 5.15.

Figure 5.15

Comparison Of The Deadweight For A Given Draft:

Conventional And Shallow Draft Designs

	Deadweight (tons)	
Draft (ft.)	Conventional Design	Shallow Draft Design
35	40,000	60,000
40	60,000	90,000
45	85,000	125,000
50	110,000	170,000
55	150,000	225,000

Source: The Ocean Shipping of Coal,
Maritime Administration, 1981.

The design and construction of shallow draft bulk carriers are within the realm of current technology. According to the Maritime Administration, several designs for this type of ship have been prepared in the U.S. in recent years, and a few ships designed for dry bulk applications have been built overseas. The concept has also been proven by the successful construction of ultra large crude tankers, which have the proportional dimensions of a shallow draft carrier rather than a conventional ship. At present, however, there is little movement to shallow draft designs. It would appear that most shipowners anticipate harbor deepening.

Another emerging technology is the transportation of coal slurries aboard ships. Slurry transportation requires a unified system, including special loading and receiving terminals, ships, and processing facilties. Critical to this technology is the means of dewatering the slurry to maximize the transportation of coal. Dewatering should avoid loss of solids and disposal of contaminated water. Moreover, the appropriate particle size for the coal must be resolved, since smaller particles promote fluidity of the slurry but increase processing costs at the receiving end. In addition, because slurried coal is considerably denser than conventional coal shipments which contain air spaces, special vessels and handling facilities will be necessary.

While studies of slurry technology continue, the carriage of slurried bulk commodities on ships is not a new concept. At present, there are slurry marine terminals in Peru, New Zealand and Japan and eight slurry carrying ships ranging from 50,000 to 141,000 deadweight tons. These terminals and ships have been used for transporting pelletized iron ores and beach sands.

Another proposed technology is the transportation of coal barges as unitized shipments in special barge-carrying vessels. This system has been studied for shipments from the Mississippi River to the extensive inland waterways of Europe. However, there are no serious discussions of applications of this system to the Pacific Basin at this time.

A final technological application is the use of self-unloading ships. Self-unloading ships are the primary means of transporting coal across the U.S. Great Lakes. They can be unloaded faster than can conventional shore-based coal discharging equipment. This reduces the time in port, an important consideration on short journeys. They can service relatively undeveloped ports, since they can take coal to destinations which do not have shore-based unloading equipment. Self-unloading ships can also discharge into other ships or barges offshore without being berthed. It is estimated that the increased construction costs of self-unloading ships over conventional dry-bulk carriers vary from about 20% for 60,000 DWT ships to about 10% for 120,000 DWT ships. They also cost more to operate, and discharge equipment results in a loss of cargo capacity for a given hull configuration compared to conventional designs.

Speculation on the market shares which will be captured by the various technologies is premature. What seems clear, however, is that shipping capability will not be a significant constraint on increased coal movement through western ports.

Chapter 6

PACIFIC RIM COAL IMPORT TERMINALS

A. Introduction

The major export market for western U.S. coal is assumed to consist of the nations of Japan, Korea and Taiwan (see Figure 6.1). Since, in analyzing ocean transport, it is necessary to consider the receiving as well as the shipping port, coal users in the three consuming countries were surveyed on the capabilities of the discharge facilities they intend to use. This chapter summarizes their responses and, to the extent the data permit, points out the receiving/transshipment strategies of various industries. This includes projected metallurgical coal requirements of the steel industry although they are presented separately from the steam coal ports.

Two major conclusions can be drawn from the information presented herein:

1. The Pacific Rim coal buyers have coal receiving terminals either existing, under construction or in the planning stages which will be capable of meeting their import needs.

2. A significant proportion of their total steam coal import capability, at least short-term, will be for Panamax or smaller sized vessels. In 1990 this share is calculated as over 40 million tons minimum, which is nearly 40 percent of the three countries' total demand (see Figure 6.2).

The role of major coal transshipment terminals is somewhat uncertain at this time, especially in Japan. It appears that modification or installation of coal handling facilities at existing ports and the addition of electric power ports will accommodate import coal requirements through 1990. After 1990 the role of large deep draft coal transshipment facilities may increase.

Figure 6.1

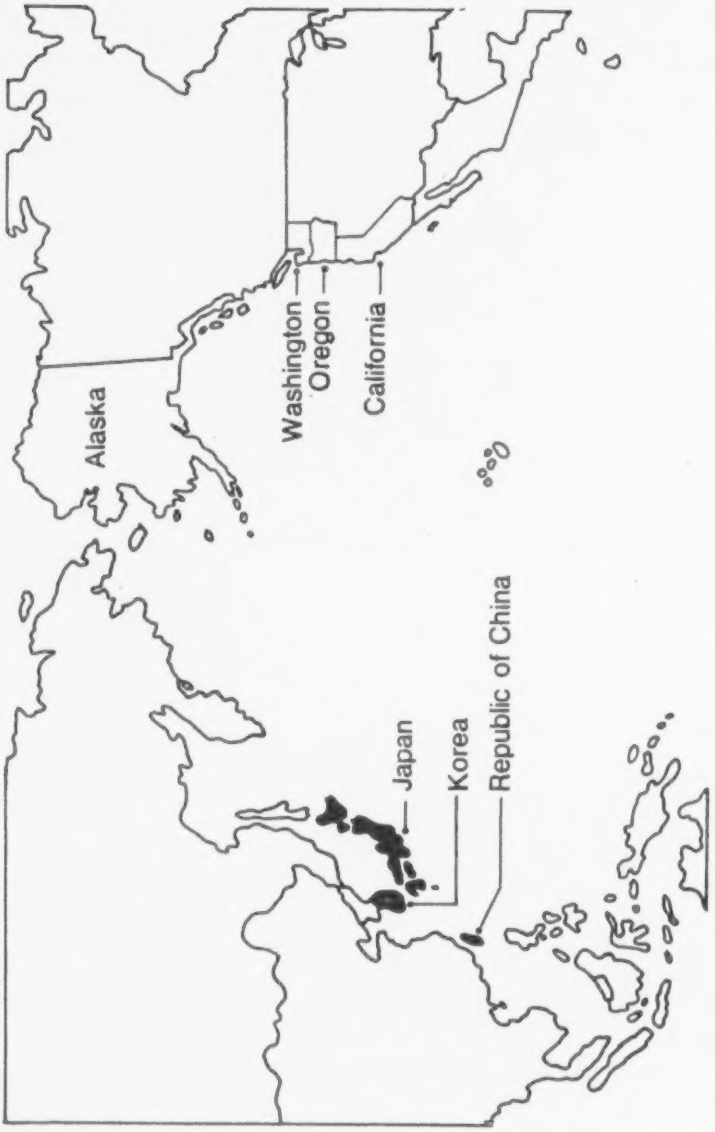

Alaska
Washington
Oregon
California
Japan
Korea
Republic of China

Figure 6.2

1990 Receiving Port Capacity For Pacific Rim Steam Coal Imports

By Vessel Size Accommodated

(MTPY; % of Total Capacity)

Vessel Size	Japan		Taiwan		Korea		Total	
100,000+ DWT	23.8*	39%	18.4	69%	5.2	31%	47.4	45%
60,000+ to 100,000 DWT	11.9	19%	-	-	4.6	27%	16.5	16%
Panamax or smaller (to 60,000 DWT)	25.8	42%	8.1	31%	7.2	42%	41.1	39%
	61.5	100%	26.5	100%	17.0	100%	105.0	100%

*Includes 7.0 million tons capacity planned for Sakito Coal Center. Construction of this facility by 1990 is now considered uncertain.

B. Japan

At the present time, Japan's major coal receiving facilities are located at the country's steel mills. Although these facilities are modern, high capacity bulk unloading terminals, they are controlled by the steel industry. Also, it is questionable whether these steel mill facilities will have adequate links to intracountry distribution systems to fulfill the requirements of industrial and utility coal consumers.

In recent months, there has been considerable study and discussion in Japan on what type of port system should be developed to accommodate the country's steam coal import requirements. Development of a comprehensive solution is complicated by such factors as the following:

- a shortage of suitable deep water port sites, especially those close to the point of coal consumption
- environmental concerns similar to those in the United States
- the cost of developing large coal receiving facilities
- the cost of intracountry distribution.

Although the study and discussion continue as to the configuration of the Japanese coal port receiving system, we report here on what appears to be the current program.

Japan initially investigated receiving the majority of its imported coal at large coal centers which would be high capacity, deep draft facilities. The costs of building the facilities, building breakwaters in the harbors, and dredging the deeper channels caused concern. When added to the high cost of

Figure 6.3

Japanese Coal Receiving Terminals

(1990)

Coal Centers ■

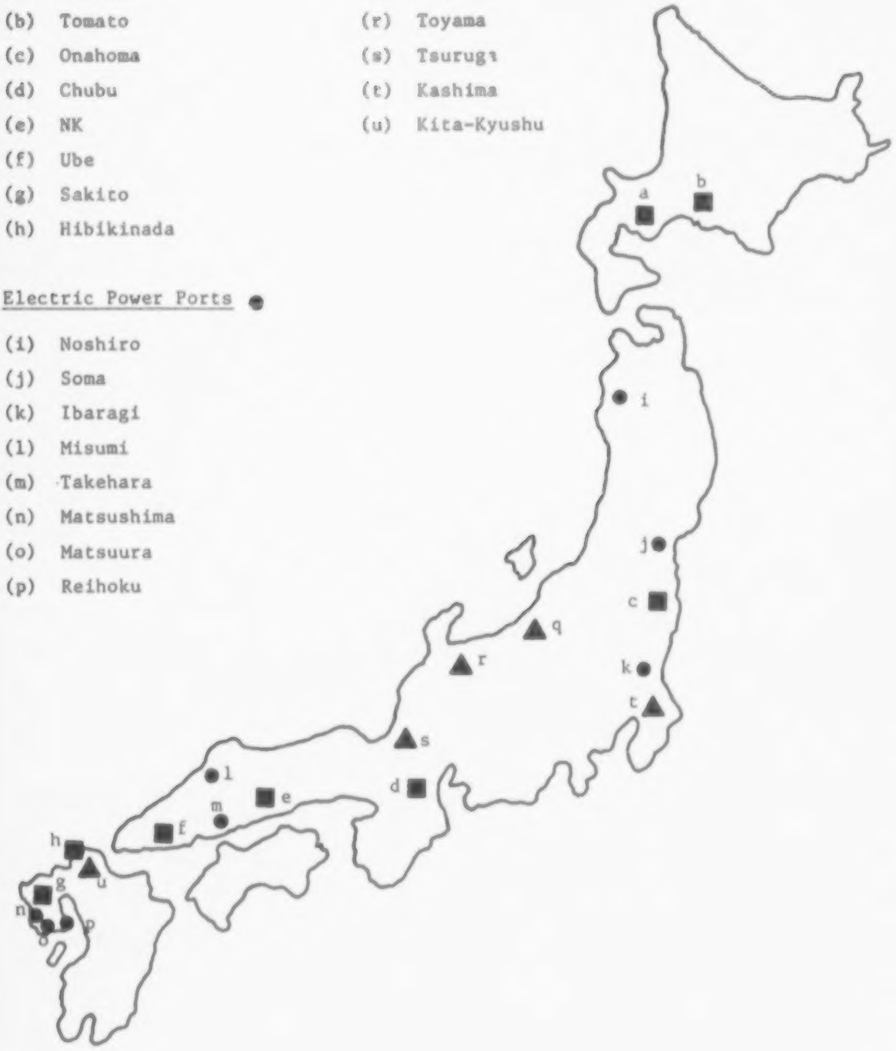
- (a) Muroran
- (b) Tomato
- (c) Onahoma
- (d) Chubu
- (e) NK
- (f) Ube
- (g) Sakito
- (h) Hibikinada

Electric Power Ports ●

- (i) Noshiro
- (j) Soma
- (k) Ibaragi
- (l) Misumi
- (m) Takehara
- (n) Matsushima
- (o) Matsuura
- (p) Reihoku

Public and Private Ports ▲

- (q) Naoetsu
- (r) Toyama
- (s) Tsurugi
- (t) Kashima
- (u) Kita-Kyushu



internal distribution, questions have been raised over the total coal center concept.

In May, 1981, the Japanese Ministry of Transportation completed a study on the "Port Facilities for Steam Coal Importation." This study resulted in the selection of 20 ports, from 61 candidates, in which coal handling facilities would be added or developed. In addition, the Japanese Coal Development Company, government agencies, and the steel industry have been involved in the establishment of the program for importing steam coal. The resulting program calls for the development of three categories of ports to accommodate steam coal imports.

The categories include major coal centers, electric power ports which will be adjacent to power plants and owned and operated by power companies and public ports which will handle coal. Intra-country distribution of coal from the coal centers or public ports to final users will be primarily (62%) by coastwise vessel, 33% by rail and 5% by truck. The location and classification of Japanese steam coal receiving ports are shown in Figure 6.3.

Three coal centers are already in operation, and five others are to be commissioned before 1990. Locations of all eight are shown in Figure 6.3 and their characteristics are listed in Figure 6.4. The Tomato and Sakito Coal Centers are sponsored by electric utilities, while the remainder are supported by others - including the iron and steel, cement, and pulp and paper industries. Regardless of sponsorship, however, most will handle coal destined for power plants.

Approximately 24 million tons of coal that utilities will import in 1990 are expected to be

Figure 6.3

Japanese Coal Receiving Terminals

(1990)

Coal Centers ■

(a) Muroran
(b) Tomato
(c) Onahoma
(d) Chubu
(e) NK
(f) Ube
(g) Sakito
(h) Hibikinada

Electric Power Ports ●

(i) Noshiro
(j) Soma
(k) Ibaragi
(l) Misumi
(m) Takehara
(n) Matsushima
(o) Matsuura
(p) Reihoku

Public and Private Ports ▲

(q) Naoetsu
(r) Toyama
(s) Tsuruga
(t) Kashima
(u) Kita-Kyushu

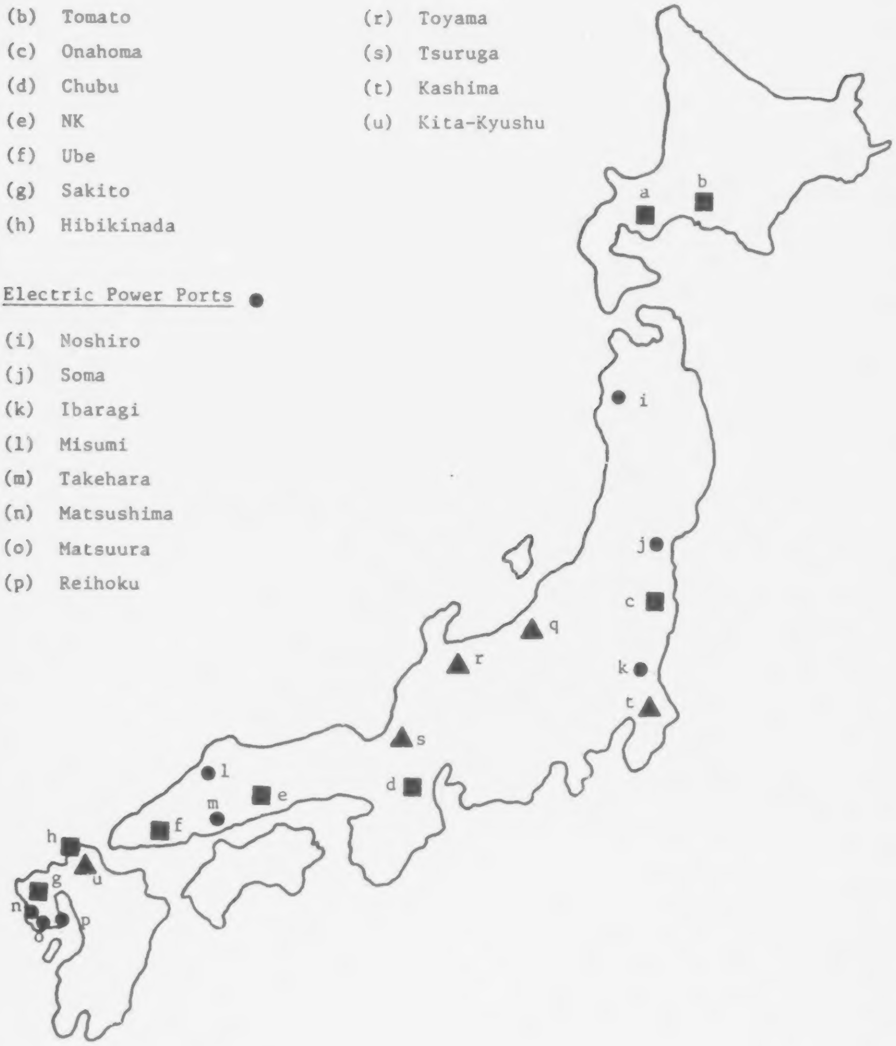


FIGURE 6.4

JAPANESE COAL RECEIVING FACILITIES
COAL CENTER PORTS (1990)

Name of Facility	Year of Commission	1990 Throughput (million tons/year) Electrical	Industrial	Total	Number of Berths	Water Depth (M)	Max. Size Vessel (1000 DWT)	Unloader Capacity (TPH)	Storage Capacity (1000 tons)	Comments
a) Muroran (Iwaizu Coal)	1981	-	1.0	1.0	1	12	50	600 x 1 500 x 1	250	For private industry — pulp, paper and cement, City of Muroran
b) Tomakomai (Tomato Coal Center)	1983/4	2.5	1.0	3.5	1	14	60	1,400 x 2	600	For Tomato-Atsuma unit II of H.E.P.C. Also cement, paper and pulp industry. Additional capacity of 5 MTPY after 1990 with 100,000 DWT vessels.
c) Onahama (Onahama Coal Center)	1st Stage '82 2nd Stage '86	4.5	0.5	5.0	2	14	60	250 x 4 800 x 2	500	For COM starting 1984, also cement and paper. Transshipment point for Tokyo Bay.
d) Yokkaichi (Chubu Coal Center)	1st Stage '82 2nd Stage '86	0.5	1.1	1.6	2	14	100	400 x 4	900	For cement and paper.
e) Fukuyama (NK Coal Center)	In operation 2nd Stage '83 3rd Stage '85+	6	1.1	7.1	5	17	200	1,500 x 6 700 x 2	850	For Tatsushima, Mizushima, Saijo and Sumitomo Niihoma power plants. Also cement. A subsidiary of Nippon Kokan.
f) Yamaguchi (Ube Coal Center)	In operation 2nd Stage '83 3rd Stage '85+	2.5	4.7	7.2	4	15	70	1,800 x 2	4,000	For Shin Ube units 1, 2, 3; Shin Onoda units 1 & 2. Also chemical and cement.
g) Nagasaki (Sakito Coal Center)	1988	7.0	-	7.0	-	20	150	2,000 x 4	1,200	This coal center comtemplated primarily to serve Reihoku power plant.

(letter designations refer to map, Figure 6.3)

delivered directly to Japanese power plants. Figure 6.5 lists the electric power ports and their capabilities.

Five public and privately operated general ports will accommodate coal imports by 1990. Three of these facilities are currently in operation. The majority of the coal handled by these ports will serve industrial users such as cement, paper and pulp or other local industry. The characteristics of these facilities and their anticipated 1990 capacities are shown in Figure 6.6.

Five major steel companies' factories in Japan are located on waterfronts and have their own ore/coal unloading/handling facilities. Ore and coal carriers used at such facilities are generally 60,000, 125,000, or 150,000 tonners though some are using 200,000 and 250,000 tonners. No proportional breakdown by collier size is available.

Figure 6.7 shows such facilities with a water depth deeper than 14 meters. Due to the economic situation, at this time those facilities are not fully utilized (60-70%); therefore, it is assumed that there will be no additional harbor work necessary for the increased volume of metallurgical coal imports.

The data indicate that by 1990, 25.8 million tons or 42 percent of the Japanese steam coal receiving port capacity will be limited to Panamax size (up to and including 60,000 DWT) vessels. Another 19 percent of the receiving port capacity will be able to accommodate vessels larger than Panamax up to 100,000 DWT, and 39% of the receiving port capacity will be at ports capable of docking vessels over 100,000 DWT. Although there are presently no definitive plans available for steam coal receiving ports after 1990, indications are that the coal centers incorporating high capacity and deep draft vessel capabilities will play an increasingly important role.

FIGURE 6.5

JAPANESE COAL RECEIVING FACILITIES
ELECTRIC POWER PORTS (1990)

Name of Facility	Year of Commission	1990 Throughput (million tons/year) Electrical	Industrial	Total	Number of Berths	Water Depth (M)	Max. Size Vessel (1000 DWT)	Unloader Capacity (TPH)	Storage Capacity (1000 tons)	Comments
h) Noshiro	1987	2.6	—	2.6	1	14	60	1,500 x 4	200	For Noshio unit 1; port expanded to 3-9 MTPY after 1990.
i) Soma	1989	2.0	—	2.0	—	—	60	—	—	For Soma unit 1, start 1989; unit 2 planned for 1990.
j) Ibaragi	1989+	2.4	.7	3.1	2	16	100	—	—	For Kita - Ibaragi (3 units) and Mito (3 units) power plants, startup about or after 1990.
k) Port of Shimane (Misumi)	1989	3.2	—	3.2	2	14	60	2,000 x 2	600	For Misumi units 1 & 2 startup 1989 & 90.
l) Takehara	1983	1.5	—	1.5	1	14	60	1,200 x 2	300	For Takehara unit 3.
m) Matsushima	In operation	2.3	—	2.3	1	14	60	700 x 4	430	For Matsushima units 1 & 2.
n) Matsuura	1986	7.7	—	7.7	—	18	130	1,200 x 4		For EPDC Matsuura units 1 & 2 and KEPC Matsuura units 1 & 2.
o)Reihoku	1988+	3.0	—	3.0	1	8	15	—	—	For Reihoku units 1 & 2; startup may be delayed due to permits.

(letter designations refer to map, Figure 6.3)

FIGURE 6.6

JAPANESE COAL RECEIVING FACILITIES PUBLIC AND PRIVATE PORTS (1990)

Name of Facility	Year of Commission	1990 Throughput (million tons/year) Electrical	Industrial	Total	Number of Berths	Water Depth (M)	Max. Size Vessel (1000 DWT)	Unloader Capacity (TPH)	Storage Capacity (1000 tons)	Comments
p) Naoetsu	In operation	—	0.6	0.6	1	14	55	240 x 2	75	For cement industry — no expansion planned.
q) Toyama	1989	1.0	—	1.0	1	12	30	450 x 2	150	For Toyama Kyodo units 1 & 2; scheduled to convert from oil 1989. Also cement.
r) Tsuruga	In operation	—	0.05	0.05	1	10	15	315	—	For cement. May be expanded for Tsuruga power plant if constructed.
s) Kashima	In operation	—	2.0	2.0	2	19	180	3,000 x 3 850 x 2	—	Excess capacity at Sumitomo Metals pier. Anticipated use for cement
t) Kita-Kyushu (Hibikinado Coal Center)	1981	—	1.5	1.5	1	13	50	1,200 x 2	—	For cement. If Hibikinado power plant constructed, port will be dredged to 17M and capacity increased to 7MTPY. Owned by Mitsui Mining.
Total										

(letter designations refer to map, Figure 6.3)

Figure 6.7

Coal/Iron Ore Discharge Berths For Japanese Steel Industry

Steel Company	Port	Water Depth(m) x Number of Berths
Nippon Steel Corporation	Oita	20-27 x 4
	Kisarazu	19 x 2; 17 x 1
	Himeji	17 x 1
	Kitakyushu	17 x 1
	Muroran	16.5 x 1; 14 x 1
	Sakai Semboku	14.5 x 1
	Kamaishi	14 x 1
	Nagoya	14 x 1
Nippon Kokan	Kawasaki	22 x 1; 18 x 1
	Fukuyama	17 x 3; 16 x 1
Sumitomo Steel	Kashima	19 x 2; 16 x 2
	Wakayama	14 x 2
Kawasaki Steel	Chiba	18 x 1
	Mizushima	17 x 2; 16 x 1
Kobe Steel	East Harima	17 x 2; 14.5 x 1; 14 x 1

C. Korea

Korea's steam coal import program is divided into two major parts: the first to fulfill the fuel requirements of the Korea Electric Company (KECO) and the second to service industrial and home heating coal requirements throughout the country. Locations of 1990 steam coal receiving facilities are shown in Figure 6.3.

Korea Electric Company (KECO) is planning the construction of two electric power ports which will be adjacent to new coal-fired power plants. The first facility, currently under construction, is at Gojeong on the western coast, and the second at Samcheonpo on the south coast. KECO is also considering oil to coal conversion of the Honam and Yeosu power plants on the southern coast. If these plants are converted, an additional two million tons per year would be transloaded through Samcheonpo. The coal would be transported 30 kilometers from Samcheonpo to Honam and Yeosu in 3,000 ton barges via intracoastal waterways. In addition, KECO is evaluating the consumption of imported coal at the Yong Dong power plant, located in the northeast. Imported coal for this station would be received through the port of Buk Peong and trucked to the power plant. The 1990 capabilities of Gojeong and Samcheonpo are shown in Figure 6.9.

Cement producers and other industrial coal consumers will receive coal through four public or privately operated ports. Coal for domestic heating will also move through these four ports. Korea Maritime and Port Administration is responsible for the development of the three terminals at Incheon, Mogpo and Ulsan. The coal terminal at Buk Peong will be built and operated by Ssangyong Corporation, with the Korean Ministry of Construction being responsible for dredging and harbor improvements.

The Port of Incheon in the northeast will serve Seoul, 30 kilometers to the west, and other industrial consumers in the Metropolitan Region.

Figure 6.8

Republic of Korea
Coal Receiving Terminals
(1990)

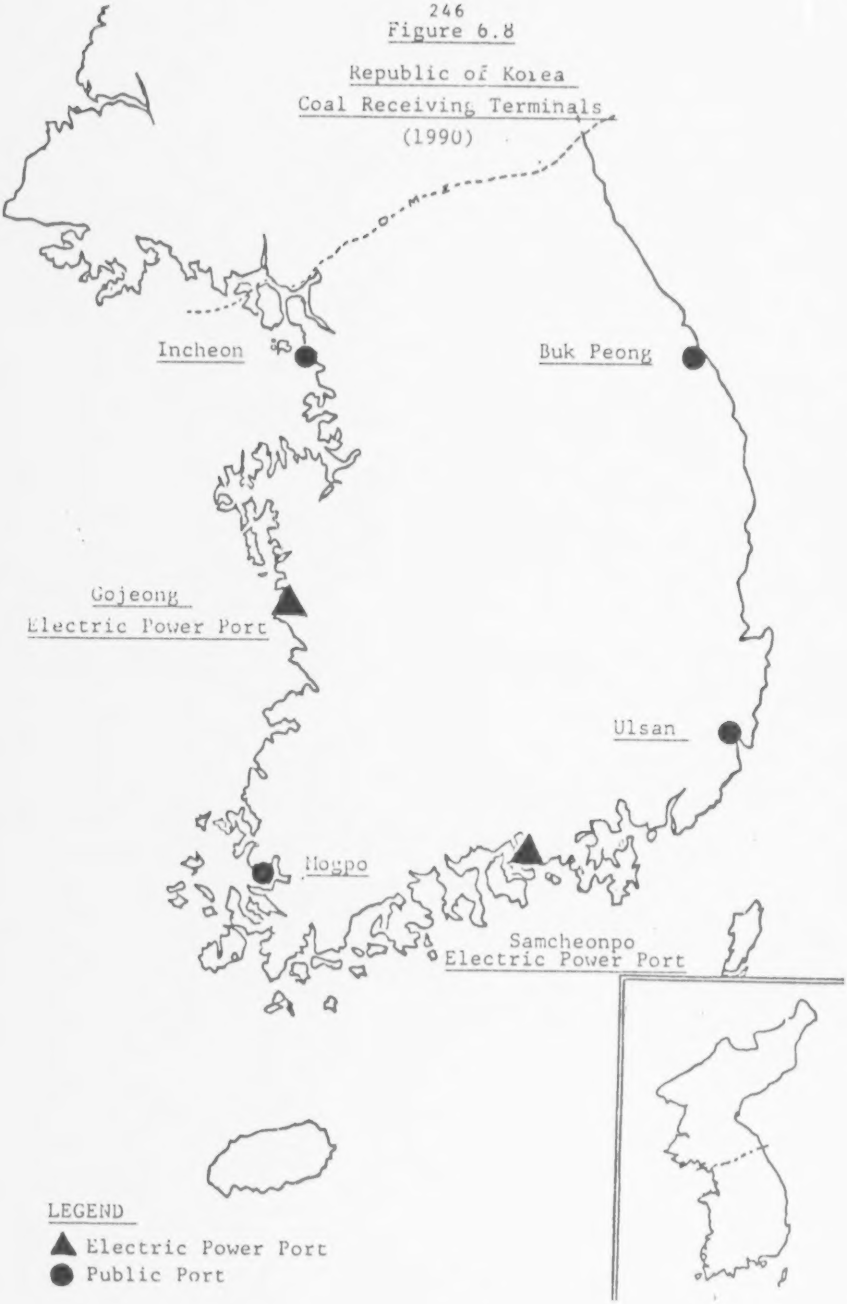


Figure 6.9

Korean Coal Receiving Facilities

1990 Projected Data

Name of Facility	Year of Commission	1990 Throughput Electrical (million tons/year)	Industrial	Total	Number of Berths	Water Depth (M)	Max. Size Vessels (1000 DWT)	Unloader Capacity (TPH)	Storage Capacity (1000 tons)	Comments
Gojeong	1983	2.5	-	2.5	1	21	150	1600 x 2	1,600	For Gojeong power plant units 1 & 2.
Samcheonpo	1983	2.7		2.7	1	16.5	120	1500 x 2	800	For Samcheonpo power plant units 1 & 2. Also may transship coal to Honam and Yeosu power plants approximately 30 kilometers to the southeast. If converted to coal these plants will consume 2 MTPY additional coal.
Incheon	1984	-	4.59	4.59	1	12	100	1000 x 2	1,000	For cement, other industries and domestic heat. 9.5 meter tide.
Mogpo	1983	-	1.1	1.1	1	11.5	30	400	100	For industrial users in Honam area. 4 meter tide.
Ulsan	1984	-	3.95	3.95	1	12	40	600	300	For cement and other industries in Young Ham area.
Buk Peong	1983	-	2.1	2.1	1	11.8	50	500	130	Facility to be built and operated by Ssangyong Company, primarily for cement; some coal may be transported to Yong Dong power plant.

Mogpo on the southeastern coast will serve the Young Nam area. Buk Peong in the northwestern coastal city of Dong Hae will service the Tae Bait area in addition to the adjacent Ssangyong Corporation cement plant. The 1990 characteristics of these facilities are also listed in Figure 6.9.

Pohang Iron & Steel Company, Ltd., the largest steel company in Korea, reports that it intends to import 7.1 million tons of coal in 1984, the last date for which projections are available. This tonnage will be discharged at the company's own terminal at Pohang City. The port's capacity is listed in Figure 6.10.

In 1990, 42 percent of Korean steam coal import capacity will be limited to Panamax (60,000 DWT) or smaller vessels. The port of Incheon, accounting for 27% of the country's coal receiving port capability, will be able to accommodate 100,000 DWT vessels. The two electric power ports of Gojeong and Samcheonpo combined will have 31% of import coal receiving capacity and will be able to accommodate vessels larger than 100,000 DWT.

Figure 6.10

Coal Discharge Terminal

Pohang Iron & Steel Co., Ltd.

Pohang City, Korea

Owner/Operator	Pohang Iron & Steel Co.
Ship Unloaders	8
Discharge Rate (TPD)	140,000
Ground Storage (metric tons)	850,000
Water Depth Channel (m)	16
Water Depth Berth (m)	16.5
Maximum Vessel Size (DWT)	100,000
1984 Throughput (MTPY)	7.1

D. Taiwan

Taiwan currently receives imported utility and industrial steam coal through the four public ports of Kaohsiung, Taichung, Keelung and Su-Ao. As these facilities have no land based ship unloading equipment, coal is offloaded by using ship's gear. Taiwan's steam coal import port program indicates that these facilities will continue operating through 1990; the majority of the coal handled through them will be for industrial consumption.

Taiwan Power Company (Taipower), the Republic of China power company, is planning the development of three large coal unloading facilities to fill its fuel requirements. The Ta-Lin coal terminal will be located in the southern port of Kaohsiung. This facility will receive and transship coal to the Nanpu and Ta-Lin power plants and to Hsinta power plant units 1-4.

Coal will be transported north from Kaohsiung 40 kilometers by dedicated 10,000 DWT coastwise barge to Hsinta where a dock, barge unloader and coal yard will be part of the power plant facilities. This system will serve Hsinta's projected fuel requirements through 1990. The expansion plans for units 5 through 8 are currently under study. One scheme being considered for the expansion is dredging of a deep draft harbor and installation of a high capacity electric power port to accommodate the total plant requirements when all eight units are in operation.

Taipower also plans the construction of two other electric power ports, one at Su-Ao on the northeast coast and one at Taichung on the west coast. These facilities will serve directly the adjacent power plants. The locations of Taiwan's 1990 coal receiving facilities are shown on Figure 6.11, and their capacities are described in Figure 6.12.

Figure 6.11

Taiwan Coal Receiving Terminals
(1990)

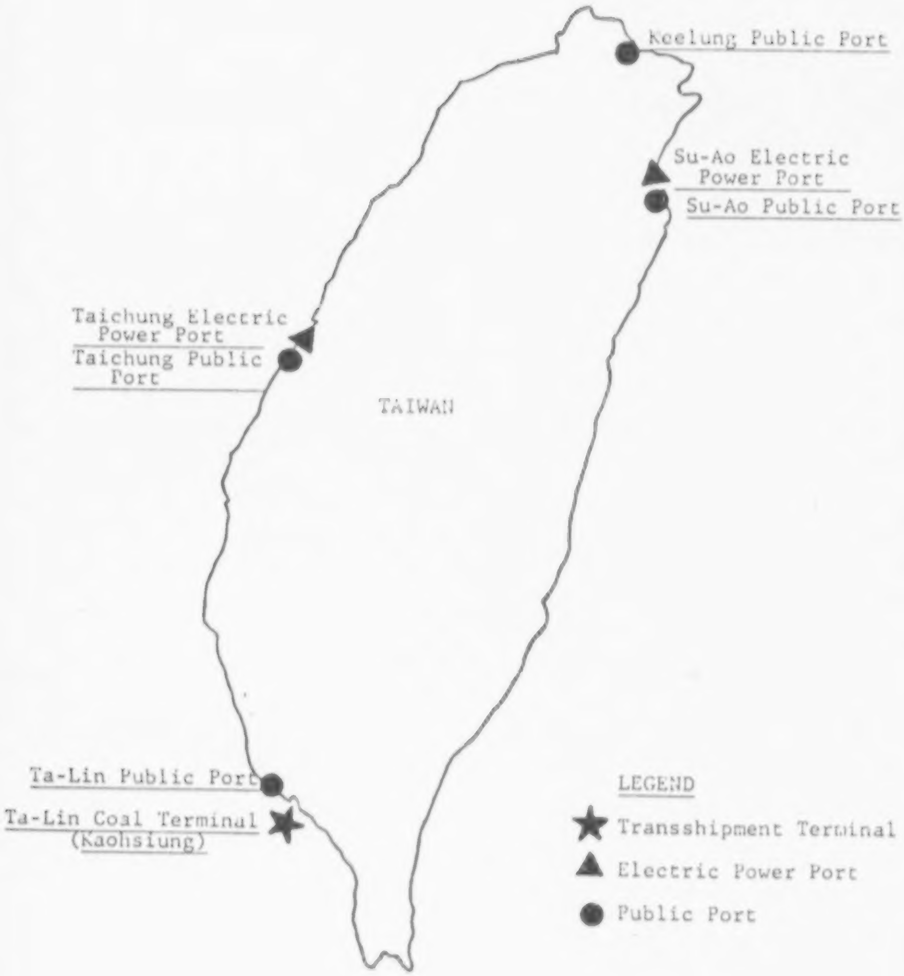


Figure 6.1.

Taiwan Coal Receiving Facilities

1990 Projected Data

Name of Facility	Year of Commission	1990 Throughput Electrical (million tons/year)	Industrial	Total	Number of Berths	Water Depth (M)	Max. Vessel Size (1000 DWT)	Unloader Capacity (TPH)	Storage Capacity (1000 tons)	Comments
Ta-Lin Coal Terminal (Kaohsiung)	1983	9.0	-	9.0	1	17.5	135	2000	900	Will receive coal for transshipment to Nanpu, Talin and Hsinta (units 1-4) power plants.
Su-Ao Electric Power Port	1986	3.1	-	3.1	1	20	200	1000 x 4	90	For Su-Ao power plant.
Taichung Electric Power Port	1966	6.3	-	6.3	1	18	135	1000 x 4	4300	For Taichung power plant.
Kaohsiung Public Port	In operation	-	Total industrial demand served through these 4 ports estimated to be 6 million tons per year by 1990.	-	1	10.5	35	Uses ships gear	1600	For industrial users in Kaohsiung.
Taichung Public Port	In operation	0.88		-	1	13	60	Uses ships gear	800	For Linkou power plant units 1 & 2 and industrial users.
Keelung Public Port	In operation	1.20*			1	10.5	35	Uses ships gear	180	For Shen-Ao power plant and industry.
Su-Ao Public Port	In operation	*		-	1	10.5	35	Uses ships gear	1300	For Shen-Ao power plant and industry.

*Both Keelung and Su-Ao are to supply the Shen-Ao power plant.

After 1990, Taipower plans construction of another electric power port to supply its Shen-Ao coal-fired plant in northern Taiwan. Two berths will be provided for 60,000 DWT vessels. A number of options are being explored, however, on the best way to serve the plant in the interim. As shown in Figure 6.12, the current plan is to transship coal through the public ports of Keelung and Su-Ao. Also under study as short-term alternatives are the Shen-Ao Mooring Dolphin and Barge Pier Project and the Pa-Shih-Men Coal Unloading Terminal Project. The former scheme would provide for offshore discharge of 60,000 DWT vessels into barges for delivery to the stockpile; the latter would offload 60,000 DWT ships at a pier and truck the coal to Shen-Ao.

China Steel Corporation presently operates a deep draft coal unloading facility adjacent to its plant in Kaohsiung harbor. China Steel Company's program for expanding its steel making capacity indicates that its coal unloading facilities will not have excess capacity to accommodate utility or industrial steam coal. Data on China Steel's receiving facilities are given in Figure 6.13.

Taiwan's new coal port facilities will all have the capability to receive ships of over 100,000 DWT and combined will account for 69 percent of 1990 coal receiving capacity. No harbor improvements are planned for existing facilities limiting these ports to Panamax or smaller vessels. These ports comprise the remaining 31 percent of Taiwan's 1990 coal import capabilities.

Figure 6.13

Coal Discharge Terminal

China Steel Corporation

Kaohsiung, R.O.C.

Owner/Operator	China Steel Corporation
Ship Unloaders	2
Discharge Rate (TPD)	20,000
Ground Storage (metric tons)	280,000
Water Depth Channel (m)	14
Water Depth Berth (m)	16
Maximum Vessel Size (DWT)	160,000
1985 Throughput (MTPY)	2.7

Appendix A

WESTERN COAL EXPORT TASK FORCE (CETF) - PACIFIC BASIN STEAM COAL EXPORT STUDY

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Appendix B

WESTERN COAL EXPORT TASK FORCE

Gubernatorial Steering Committee and Staff Working Group

A. Gubernatorial Steering Committee

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Governor
State of Utah
State Capitol
Salt Lake City, UT 84114

The Honorable Bruce Babbitt
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Appendix C

WESTERN COAL EXPORT TASK FORCE

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Appendix D

CHARTER OF THE WESTERN COAL EXPORT TASK FORCE-PACIFIC BASIN STEAM COAL EXPORT STUDY

A. CHARGE

The Western Coal Export Task Force-Pacific Basin Steam Coal Export Study is hereby initiated by the Western Coal Export Task Force (CETF), the Japan Coal Development Company (JCD), the Taiwan Power Company (Taipower), and the Korea Electric Company (KECO). Its purpose is to consolidate, verify, and synthesize information for business, government, and others to use, if they choose, in making decisions that will trigger a long-term, stable steam coal trade between the western U.S. and the Pacific Basin. The preliminary report of the joint study will be issued to sponsors by mid-September 1981. Based on review of findings and conclusions, sponsors will determine the necessity and timing of further investigation. The study will conclude no later than December 31, 1981.

B. BACKGROUND

The Western Coal Export Task Force (CETF) was formed by more than 70 coal producers, railroad executives, and port managers and developers in October 1981, under the auspices of the Western Governors' Policy Office (WESTPO). Its purpose is to help solve problems impeding long-term, stable coal trade between the western U.S. and the Pacific Basin.

U.S. industry stands ready to invest hundreds of millions of dollars to serve the Pacific Basin market for steam coal — in expanded mine capacity and transportation infrastructure development — if the economics of such investments are reasonable. Moreover, steam coal trade will (1) improve our economic ties, (2) improve our balance of payments, (3) enhance the concept of free trade by providing abundant U.S. energy reserves to allies who have a need for those resources, and (4) reduce global dependence and pressures on unstable oil supplies.

However, investment decisions are needed today for expanded steam coal trade five years from now. U.S. export interests need to have information on conditions and plans in the Pacific Basin so that the expansion of U.S. production and infrastructure can be integrated with the timing of demand and off-loading facility construction in Pacific Basin countries. Pacific Basin buyers need objective, validated information about the U.S. coal supply and transportation systems so that investments and long-term contracts can be consummated. Therefore, the joint study is undertaken as a coordinated approach to examining and resolving the issues on both sides related to large-volume, long-term coal export from the western U.S. to the Pacific Basin.

The Western CETF-Pacific Basin joint study results from cooperative efforts initiated in 1979 between the public and private sectors in the U.S. and between Pacific Basin buyers and sellers. The western U.S. coal export industry, western U.S. exporters, western governors, and the federal government all support the study. On the buying side, the utility, cement, and steel industries in Japan, the Republic of Korea (RoK), and the Republic of China (RoC), are participating with U.S. exporters under bilateral agreements between a lead organization in each country and the Western CETF.

The study will analyze a range of issues in steam coal export, considering both buyers and sellers, including the following:

- Pacific Basin market for western U.S. steam coal: quantity, type and quality specifications, timing of need, committed and uncommitted volumes, and technological changes influencing buying decisions.

- Western U.S. steam coal supply: quantity, type and quality specifications, location and timing of availability, and buyer interest in equity participation in mines.

- Overland transportation: mine mouth links, system capacity and commodities mix, physical and environmental constraints, potential for expansion and upgrading, lead times for expansion, published tariffs, and coal slurry technology.

- Ports and marine transportation: world bulk vessel fleet (present and planned), capacity and timing of development for exporting and receiving ports, generic capital and operating costs, lead times for port expansion, announced plans to alleviate port congestion, and opportunities for foreign investment.

- Institutional, legal, and regulatory factors: antitrust regulations, international trade agreements, coal leasing laws, tax structures, and legislative initiatives.

The study is fact-finding only. It will not recommend a specific mine, railroad route, or port site. It will verify, consolidate, and synthesize information for business to use, if it chooses, in making business decisions. At the same time, during the study, bilateral business negotiations are expected to continue as in the past.

The study will be objective, under the auspices of the Western Governors' Policy Office (WESTPO). No single business interest or political preference will be highlighted or allowed to unduly influence the outcome.

C. APPROACH

The study is sponsored and guided by coal buyers and sellers, and by industry and government. The joint study process includes a number of organizational elements designed to ensure an appropriate balance between policy and technical considerations. These include (1) a Policy Liaison Group, (2) a Steering Committee, and (3) Industry Task Groups.

The Policy Liaison Group, chaired by Utah Governor Scott M. Matheson, Western CETF Chairman, and including western U.S. industry representatives, will communicate and collaborate directly with the working group in each cosponsoring country to: (1) oversee the study process, (2) assess and suggest policies and directions for study inquiry, (3) monitor the industry technical study process, and (4) accept and approve all official reports of the study process.

The Gubernatorial Steering Committee, chaired by Utah Governor Scott M. Matheson and composed of the governors of ten other participating states —including Governors Babbitt (AZ), Brown (CA), Lamm (CO), Evans (ID), Schwinden (MT), List (NV), King (NM), Atiyeh (OR), Spellman (WA), and Herschler (WY). The Gubernatorial Steering Committee oversees the study process from a state perspective — i.e., performs the functions of the Policy Liaison Group on behalf of state government. The work of the governors on the Gubernatorial Steering Committee is assisted by governors' representatives on a Staff Working Group (SWG).

The Steering Committee, composed of representatives of the five industry task groups, representatives of state government, and representatives of the Policy Liaison Group will: (1) assure timely completion of task group products, (2) coordinate, synthesize, and interpret individual task group reports, and (3) advise the Western CETF chairman on operational matters of the Task Groups, including resource allocation to special studies.

Industry Task Groups will produce a report on key issues in each of the five study areas: (1) Pacific Basin demand for steam coal, (2) western U.S. coal supply, (3) overland transportation, (4) ports and marine transportation, and (5) institutional and regulatory factors.

Members of the Industry Task Groups will be professional and policymaking representatives of the industries sponsoring the study. Each task group will include a representative of state government, to help ensure that subsequent business decisions will be more fully and broadly understood by government and to facilitate government assistance in overcoming some of the constraints to a substantial coal trade. Each task group will be chaired by an industry sponsor/member and assisted by a technical associate, who will help assemble, analyze, integrate, and report information.

The work of task groups will be reviewed by an attorney to ensure that agendas, tasks, and decisions are consistent with federal, state, and local statutes and regulations appropriate to such gatherings.

D. MEMBERSHIP

The Western Coal Export Task Force (CETF) will engage in three separate but parallel bilateral cosponsorship agreements with each of the three major steam coal-using countries in the Pacific Basin (Japan, South Korea, and the Republic of China). All major industries in the coal chain are participating: coal producers, railroads, and ports on the U.S. side and utilities, cement, and steel companies on the Pacific Basin side.

Membership in the Western CETF includes (1) coal export industries — coal producers, railroads, and port developers, (2) federal agencies (ex officio), including the Department of Energy (DOE) and Army Corps of Engineers, and (3) western governors who choose to participate on the gubernatorial steering committee, including the WESTPO governors and the governors of Washington, Oregon, and California.

Lead Pacific Basin cosponsoring organizations are the Japan Coal Development Company (JCD), Taiwan Power Company, and the Korea Electric Company (KECO). In each country, the lead organization has the support and participation of the cement and steel industries and the central government.

E. FINANCING

The Western CETF will cosponsor the study under separate but parallel bilateral agreements with the Japan Coal Development Company (JCD), Taiwan Power Company, and the Korea Electric Company (KECO). The study is funded at $400,000, with each of the four cosponsors contributing equal shares. The U.S. share is financed completely by industry subscriptions. Study funds are administered by WESTPO, with management oversight by the Policy Liaison Group.

APPENDIX E

CHRONOLOGY OF EVENTS RELATED TO THE WESTERN COAL EXPORT TASK FORCE PORT AND MARINE TASK GROUP

October 10, 1980	Governor Scott M. Matheson (Utah), Chairman of the International Market Development Steering Committee of the Western Governors' Policy Office (WESTPO), hosts a coal export briefing. More than 70 coal producers, transportation executives, and port executives and developers attend. Participants agree to form the Western Coal Export Task Force (CETF) under the auspices of WESTPO, to foster the expansion of steam coal exports from the western U.S. to the Pacific Basin.
February 20, 1981	At a meeting of the Western CETF, participants endorse the concept of a study of western U.S. steam coal exports to the Pacific Basin, to be jointly sponsored by Pacific Basin buyers and western U.S. exporters. They also decide that industry task groups should carry out the research and analysis tasks as much as possible, minimizing the use of third parties.
April 11-22, 1981	Governor Matheson dispatches a seven-member delegation to the Pacific Basin to determine coal-user interest in participating in a study of western U.S. steam coal trade. The mission includes representatives of coal producers, railroads, and ports.
April 17, 1981	During the Western CETF mission to the Pacific Basin, Kazuhiro Kotani, Director of the Japan Coal Development Company (JCD), and Philip M. Burgess, WESTPO Executive Director representing the Western CETF, sign a memorandum of understanding to cosponsor a joint study of western U.S. coal exports to the Pacific Basin. Similar agreements are subsequently signed with David S. L. Chu, President of Taiwan Power Company, and Nack Chung Sung, Executive Vice President of the Korea Electric Company (KECO).

May 16, 1981	WESTPO governors, in a meeting chaired by WESTPO chairman Ed Herschler (Wyoming) at the Governor's mansion in Denver, Colorado, approve the proposals for a joint study of coal export issues with Japan, the Republic of China, and South Korea and endorse the general approach of the Western Coal Export Task Force.
June 1, 1981	Following escrow deposits of agreed-upon contributions by joint study sponsors, the joint study is formally initiated.
June 9-10, 1981	The organization meeting of Industry Task Group chairmen and technical associates is held in Denver, Colorado, to review the study scope, approach, ground rules, and schedules.
July 1, 1981	The Port and Marine Task Group chaired by John Bowersmith, of Soros Associates, meets to outline its scope of study and approach.
July 4-10, 1981	At the request of Western CETF Demand Task Group Chairman C. R. Moore, Marketing Manager of the Minerals Division, Getty Oil Company, Western CETF Chairman Scott M. Matheson dispatches a mission to the Pacific Basin. Western CETF representatives meet with study cosponsors in Japan, South Korea, and the Republic of China and specialists in coal use and port infrastructure development in those countries.
July 15, 1981	The Western Coal Export Task Force (CETF) hosts a Study Review Meeting in Lake Tahoe, Nevada. Delegations from JCD, Taiwan Power Company, and KECO present to CETF members information on their demand for steam coal and receiving port facilities.
July 26, 1981	Philip M. Burgess, Western CETF Study Director, meets to discuss the study with representatives of national environmental organizations in Washington, DC. The Organization of Resource Councils, Environmental Policy Center, Sierra Club, and Friends of the Earth are represented.
July 28, 1981	The first mid-course policy review of the study findings is held in Denver, Colorado. In attendance are the Western CETF Steering Committee and members of the Staff Working Group.

September 11, 1981	Western CETF Steering Committee report review meeting at WESTPO offices.
September 28 - October 8, 1981	Governor Scott M. Matheson, Western CETF Chairman, dispatches a mission to the Pacific Basin to verify information on steam coal demand and receiving ports and to give a preliminary report on study findings.
October 10-18, 1981	Governor Scott M. Matheson, Western CETF Chairman, dispatches a policy mission to the Pacific Basin, led by Philip M. Burgess, Study Director. The delegation presents findings of the study and receives review and comment from Pacific Basin cosponsors.
October 19, 1981	The Staff Working Group meets in Denver, Colorado, to formally review study reports and discuss follow-up actions.
October 20, 1981	The Policy Liaison Group meets in Denver, Colorado, to formally review and approve study technical reports and discuss dissemination strategies.
November 17, 1981	Governor Scott M. Matheson and Philip M. Burgess meet with national environmental leaders in Washington, DC to receive their comments on the study reports.
November 20, 1981	The Policy Liaison Group meets in Denver, Colorado, to review the draft of the summary report.
December 10-11, 1981	Governor Scott M. Matheson convenes a final meeting of the U.S. and Pacific Basin study cosponsors in Honolulu, Hawaii, to formally release the study reports and to discuss implications and conclusions. Delegations from each of the Pacific Basin Working Groups, as well as Western CETF members, participate.

APPENDIX F

A Guide To Commonly Used Terms, Abbreviations and Acronyms

Terms	Description
Bar	Ridge of sand or gravel formed at the mouth of a river or harbor by material transported downstream. Can be hazardous to navigation both because of reduced available draft and because of rough water conditions which may result.
Bulk carrier	Ocean-going, single-deck vessel designed to carry liquid or solid bulk cargos, such as coal, ore, or petroleum.
Bunkers	Ship fuel. The term can include diesel oil, fuel oil, and coal, depending on the context.
Demurrage (rail)	A charge paid by a coal shipper to the servicing railroad. Intended to compensate the railroad for use of the railroad equipment beyond the time designated in the tariff, usually for hours.
Demurrage (ship)	A charge paid by a charterer to a ship owner to compensate the owner for use of the ship beyond the agreed loading and discharging times (laytime). Typically, up to five days laytime are provided under the

	charter agreement at the loading port and five days laytime at the discharge port.
DWT	Deadweight tonnage. The difference between the load displacement and the lightweight. The latter includes the steel and propelling machinery. Therefore, the total deadweight includes the cargo, fuel, food, water, stores, provisions, passengers, crew, and baggage. The deadweight tonnage of a ship is often assumed to approximate the cargo-carrying capacity of the ship.
Leachate	Liquid that percolates through some material. In the case of coal pile leachate, rainwater that drips through the coal piles.
MLLW	Mean lower low water. The average water depth at the lower of the two low tides that occur during a tidal day.
MTPY	Million tons per year.
OBO	One type of combined carrier. OBOs can carry ore, bulk, and oil cargos, and are distinguished from O/Os (ore and oil carriers).
Panamax	Generally refers to ships in the 50,000 - 70,000 DWT size range designed to the maximum dimensions capable of transitting the Panama Canal.

Reclaim	Process of removing material from the stockpile for shiploading.
Shallow draft design	A ship design in which cargo-carrrying capacity is increased by lengthening and widening the hull to a greater extent and by increasing the draft to a lesser extent than in a typical vessel configuration.
Throughput	The amount of material passing through a transportation system, such as a port. For bulk terminals or individual pieces of equipment, throughput is usually measured in tons per hour, day, or year.
Tidal advantage	Additional water depth available at high tide. Ships using tidal advantage sail at high tide to gain additional clearance over the bottom.
TPD	Tons per day.
TPH	Tons per hour.

UNITS OF MEASURE

Short ton
= 2,000 pounds
= 0.893 long ton
= 0.907 metric ton

Long ton = 2,240 pounds
= 1.120 short tons
= 1.016 metric tonnes

Metric ton = 2204 pounds
= 1.102 short tons
= 0.9842 long ton

Meter = 39.37 inches
= 3.2808 feet

Foot = 0.3048 meter

Fathom = 6 feet

APPENDIX H

Description of John F. Baldwin Ship Channel Project

AUTHORIZED PROJECT

The John F. Baldwin Ship Channel project, hereinafter referred to as the JFB Project, consists of deepening four existing deep-draft navigation channels, and some related route modifications. The proposed route is shown in Figure 2. Specifically, the project would:

1) Deepen the channel across the San Francisco Bar to 55 feet (2,000 feet wide). This was completed in 1974;

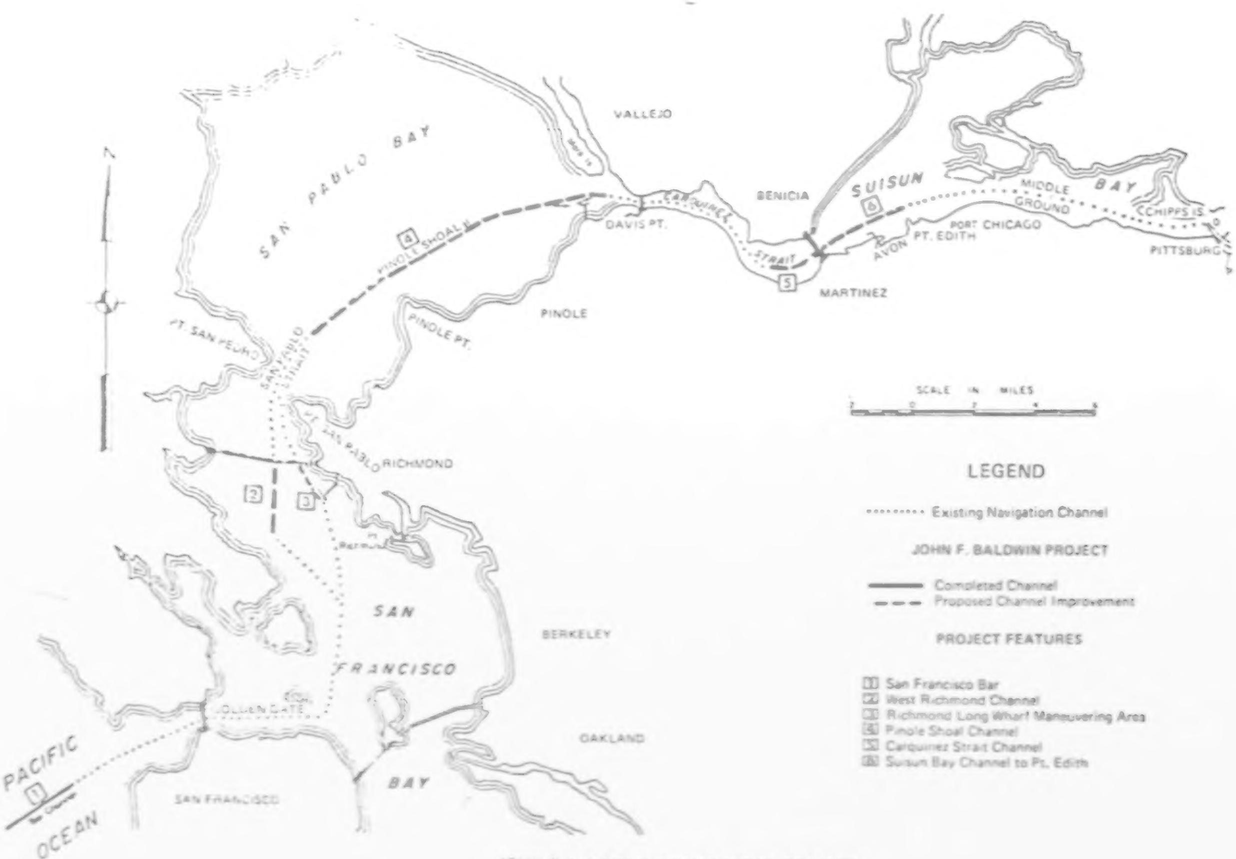
2) Deepen and widen the West Richmond Channel leading through the west navigation opening beneath the Richmond-San Rafael Bridge to 45 feet and 800 feet, respectively, and provide a 45-foot deep maneuvering area adjacent to the Richmond Long Wharf;

3) Deepen and widen the Pinole Shoal Channel through San Pablo Bay to 45 feet and 750 feet, respectively, and provide a 45-foot deep maneuvering area opposite Davis Point;

4) Deepen and widen the Carquinez Strait Channel to 45 feet and 700 feet, respectively; and

5) Deepen and widen the Suisun Bay Channel from Martinez to Pt. Edith to 45 feet and 650 feet, respectively, and provide a 45-foot deep maneuvering area adjacent to Martinez.

The channel side slopes are 1 on 2 through the San Francisco Bar, 1 on 3 for the West Richmond and Pinole Shoal Channels, and, generally, 1 on 4 upstream of San Pablo Bay.



JOHN F. BALDWIN SHIP CHANNEL PROJECT

EXISTING AND PLANNED SHIP CHANNEL CONFIGURATIONS

The channel routes for the John F. Baldwin, Stockton, and Sacramento Deep Water Ship Channels are shown in Figure 6. Table 1 gives the channel dimensions for the existing configuration, and for the three channel improvement plans representing the incremental development of the JFB Project. Also included are the existing and plan channel dimensions for the Stockton and Sacramento Ship Channels. The improved channels for these two projects, and the deepened channel through the San Francisco Bar (completed in February, 1974), were common to all JFB Plan tests. The existing channel configuration and the four channel plans which were evaluated in the JFB test program are described below.

1) Existing conditions:

The existing navigation project includes maintenance of the JFB Channel (55 feet deep by 2,000 feet wide) through the San Francisco Bar. The existing West Richmond Channel is naturally deeper than 35 feet for more than a 600-foot width. The large irregularly shaped maneuvering area adjacent to the Richmond Long Wharf is maintained at a 35-foot depth. The Pinole Shoal Channel through San Pablo Bay and the Carquinez Strait Channel are each maintained at a 35-foot depth and 600-foot width, and the Suisun Bay Channel from Martinez to Pittsburg is maintained at a 30-foot depth and 300-foot width. Both the Stockton and Sacramento River Channels have depths of 30 feet throughout their entire routes. The Stockton Channel is 400 feet wide through New York Slough, and then varies from 400 to 225 feet wide up the San Joaquin River to Stockton. The Sacramento River Channel is 300 feet wide from Pittsburg to mile 15.0 on the Sacramento River, and 225 feet wide from mile 15.0 to mile 43.0 via Cache Slough and the man-made channel to Sacramento. It should be noted that the above conditions do not include the minor channel improvement in Suisun Bay between Martinez and Avon, where the channel was deepened to 35 feet in 1963.

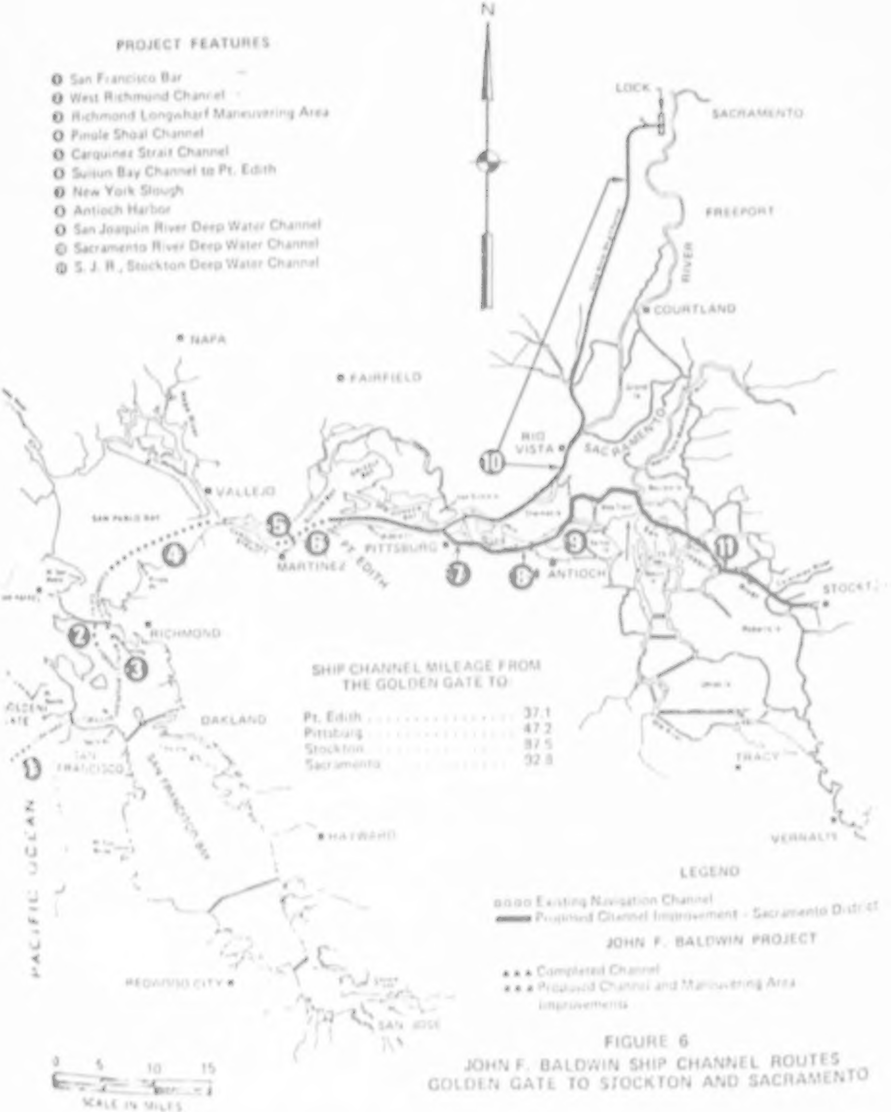


FIGURE 6
JOHN F. BALDWIN SHIP CHANNEL ROUTES
GOLDEN GATE TO STOCKTON AND SACRAMENTO

TABLE 1

EXISTING AND PLAN SHIP CHANNEL DIMENSIONS

LOCATION	DIMENSIONS		EXISTING	PLAN IDENTIFICATION
	Depth[1] (ft)	Width[2] (ft)		
1. San Francisco Bar	55	x 2000	X	H-1 L M-1 M
2. West Richmond*	35	x 600	X	H-1
	45	x 800		L M-1 M
3. San Pablo Bay	35	x 600	X	H-1 L
	45	x 750		M-1 M
4. Carquinez Strait	35	x 600	X	H-1 L M-1
	45	x 700		M
5. Suisun Bay				
a. Martinez-Pt Edith	30	x 300	X	
	35	x 600		H-1 L M-1
	45	x 650		M
b. Pt Edith-Middle Pt	30	x 300	X	
	35	x 600		H-1 L M-1 M
c. Middle Pt-Pittsburg	30	x 300	X	
	35	x 400		H-1 L M-1 M
6. Stockton Ship Channel				
a. New York Slough	30	x 400	X	
	35	x 400		H-1 L M-1 M
b. San Joaquin River	30	x 400-225	X	
	35	x 400-225		H-1 L M-1 M
7. Sacramento Ship Channel				
a. Pittsburg-mile 3.5	30	x 300	X	
Sacramento River	35	x 400		H-1 L M-1 M
b. Mile 3.5-mile 15.0	30	x 300	X	
Sacramento River	35	x 400		H-1 L M-1 M
c. Mile 15.0-mile 18.6	30	x 225	X	
Cache Slough	35	x 300		H-1 L M-1 M
d. Mile 18.5-Mile 43.0	30	x 225	X	
Manmade channel to Sacramento	35	x 250		H-1 L M-1 M

*Includes irregular shaped maneuvering area adjacent to the Richmond Long Wharf.

NOTES:

1. Depths are below MLLW.
2. Given widths are bottom widths.

2) Plan H-1:

Plan H-1 serves as the "base" condition for establishing the salinity distribution throughout the model with which to compare the salinity levels produced by the other channel configurations. This plan consists of the existing channel 35 feet deep by 600 feet wide extending from the Golden Gate to Martinez in Suisun Bay, and deepening all reaches of the proposed Stockton and Sacramento Ship Channels upstream of Martinez to a depth of 35 feet. These two projects were included as part of the "base" condition, since tests conducted to date indicated that these projects have no discernable impact on Delta salinities. The authorized Stockton Ship Channel project consists of the following widths: 600 feet from Martinez to Middle Pt. and 400 feet from Middle Pt. to Pittsburg in Suisun Bay; 400 feet in New York Slough; and 400-225 feet in the San Joaquin River to Stockton. The recommended Sacramento Ship Channel project consists of the following widths: 400 feet from Pittsburg to mile 15.0 on the Sacramento River; 300 feet in Cache Slough from mile 15.0 to mile 18.6; and 250 feet in the man-made channel upstream of Cache Slough (mile 18.6) to Sacramento (mile 43.0).

3) Plan L

Plan L includes all features of Plan H-1 plus the improvement of the first increment of the JFB Project. This consists of deepening and widening the West Richmond Channel to 45 feet and 800 feet, respectively, and deepening the large irregulary shaped maneuvering area adjacent to the Richmond Long Wharf to 45 feet. Details of this plan are shown on Figure 7.

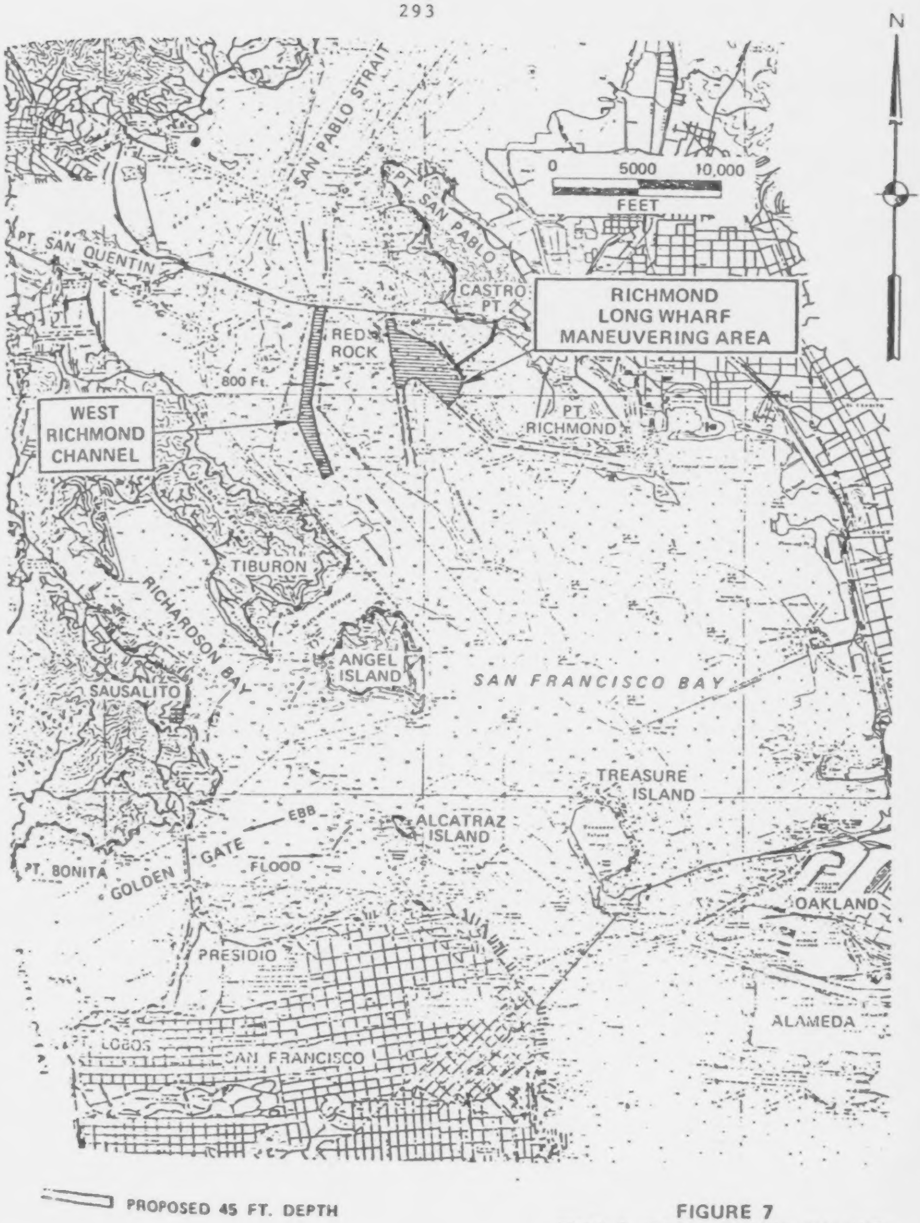


FIGURE 7
JOHN F. BALDWIN SHIP CHANNEL
PLAN L

4) Plan M-1:

Plan M-1 includes all features of Plan L plus the addition of the second increment of the JFB Project--deepening the Pinole Shoal Channel through San Pablo Bay to 45 feet and increasing its width to 750 feet. Also, a 45-foot deep maneuvering area is provided adjacent to the proposed channel improvement at Davis Pt. Details of Plans M-1 and M are shown on Figure 8.

5) Plan M:

Plan M represents the complete JFB Project, which includes all the features of Plan M-1 plus deepening and widening the Carquinez Strait Channel downstream of Martinez to 45 feet and 700 feet, respectively, and deepening and widening the Suisun Bay Channel from Martinez to Pt. Edith to 45 feet and 650 feet, respectively. Also, a 45-foot deep maneuvering area is provided adjacent to the proposed channel improvement at the Martinez and Avon port facilities.

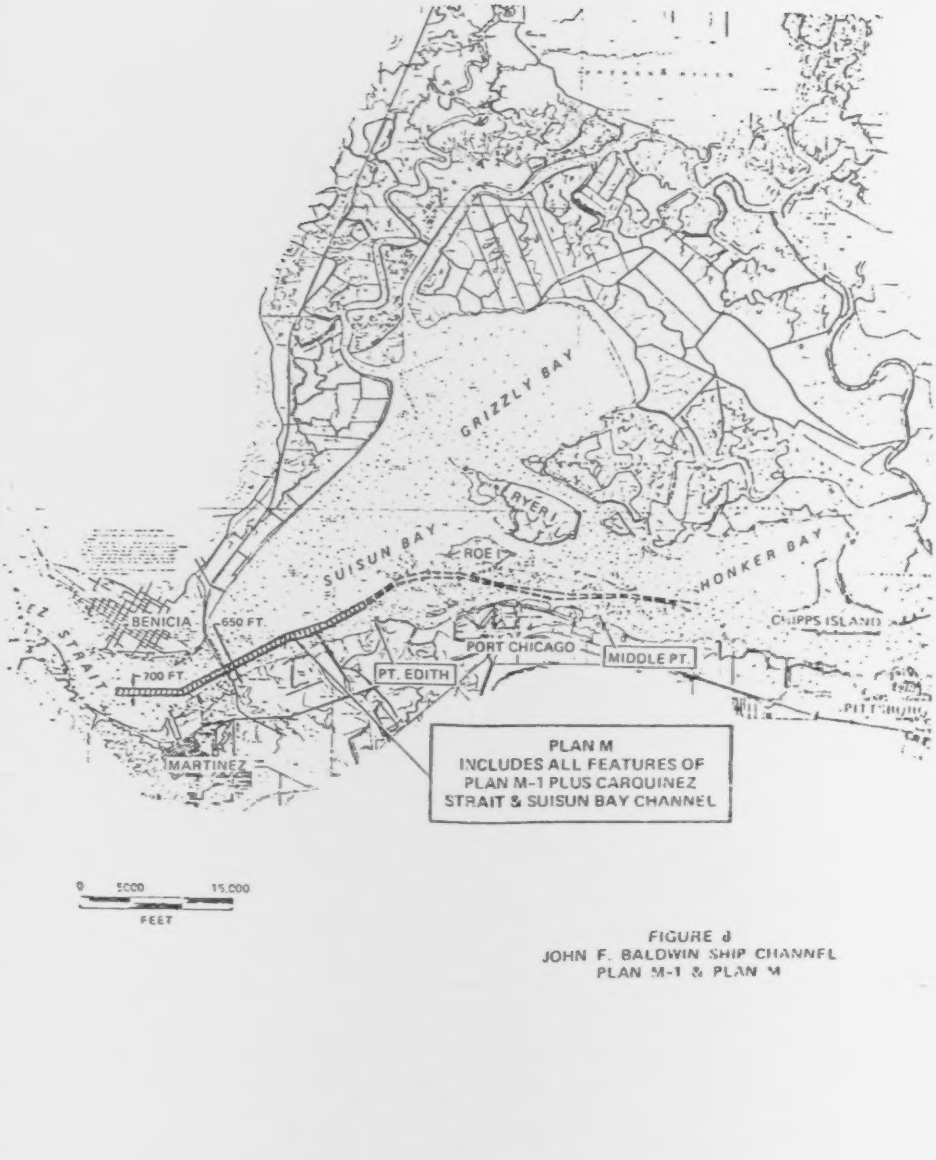
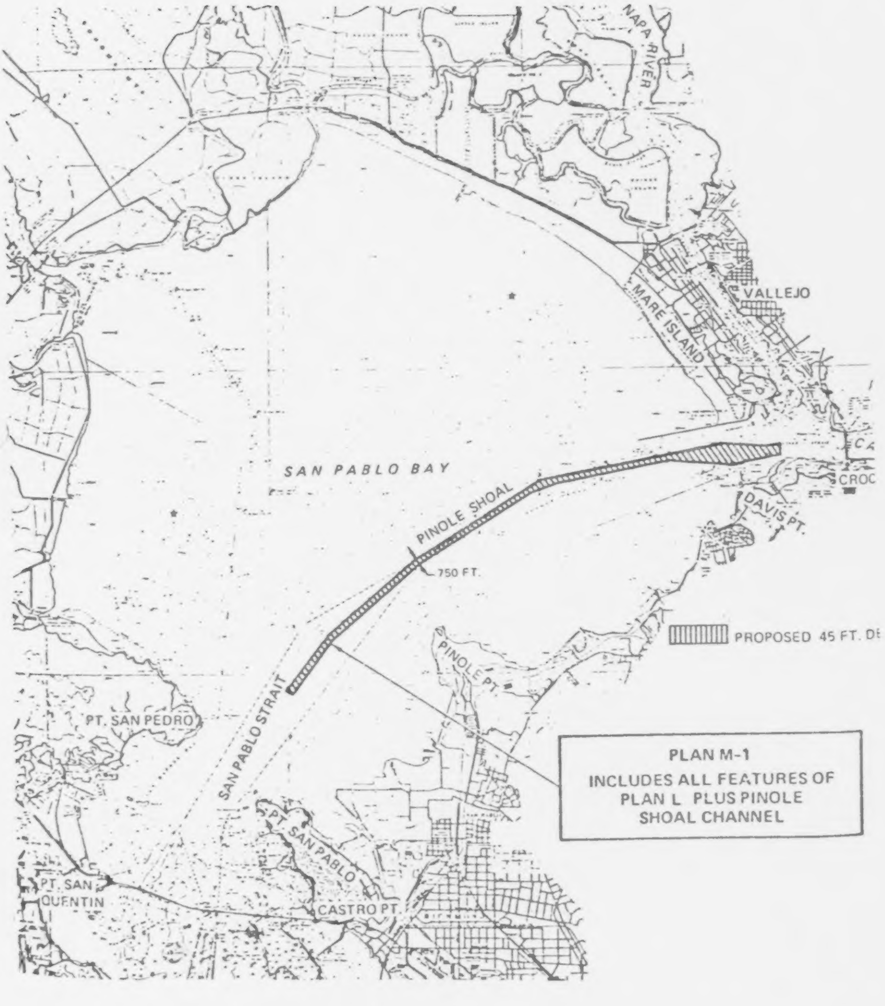


FIGURE 8
JOHN F. BALDWIN SHIP CHANNEL
PLAN M-1 & PLAN M



PLAN M-1
INCLUDES ALL FEATURES OF PLAN L PLUS PINOLE SHOAL CHANNEL

APPENDIX I

FORM NO. 30-104

Americanized Welsh Coal Charter

AMERICANIZED WELSH COAL CHARTER*

APPROVED BY
ASSOCIATION OF SHIP BROKERS & AGENTS (U.S.A.), INC.
NEW YORK—1953; AMENDED 1979.

It is this day mutually agreed, BETWEEN 19

Owner of the Steamship/Motorship
of , built at of
tons net register, or thereabouts, and about tons total deadweight inclusive of bunkers, classed
in length overall beam
draft now
and Charterer;

1. That the said vessel being tight, staunch and strong, and in every way fitted for the voyage, shall, with all possible dispatch, sail and proceed to

and there load, always afloat, in the customary manner from the Charterer, in such dock as may be ordered by him, a full and complete cargo of coal not exceeding tons nor less than tons, quantity at Vessel's option, and not exceeding what she can reasonably stow and carry, over and above her tackle, apparel, provisions and furniture, and being so loaded, shall therewith proceed, with all possible dispatch, to

or so near thereunto as she can safely get, and there deliver her cargo alongside any wharf and/or vessel and/or craft, as ordered, where she can safely deliver, always afloat, on being paid freight at the rate of U.S. currency per ton of 1,000 kilos on bill of lading quantity. The Owner shall furnish, if required, a statutory declaration by the master and other officers that all cargo received on board has been delivered. The freight is in full of loading, dumping and trimming, and all port charges, pilotages, agency fees and consulages on the vessel. All wharfage dues on the cargo to be paid by the Charterer.

2. The FREIGHT is to be paid

3. Notice of approximate quantity of cargo required and of vessel's expected date of arrival at port of loading to be given to Charterer or his agents at least days in advance.

4. The Cargo to be loaded into vessel weather working day(s) of 24 consecutive hours, (excluding bunkering time, Sundays, custom house, colliery, legal and/or local holidays, and from noon on Saturday or the day previous to any such holiday to 7 a.m. on Monday or the day after any such holiday, unless used in which event only time actually used in loading cargo to count) commencing 24 hours after vessel tenders and is ready to load, unless sooner worked, whereupon time is to commence and written notice is given of the vessel's being completely discharged of inward cargo and ballast in all her holds and ready to load, such notice to be given between business hours of 9 a.m. and 5 p.m., or 9 a.m. and 1 p.m. on Saturdays. Any time lost through riots, strikes, lockouts, or any dispute between masters and men, occasioning a stoppage of pitmen, trimmers or other hands connected with the working or delivery of the coal for which the vessel is stemmed, or by reason of accidents to mines or machinery, obstructions, embargo or delay on the railway or in the dock, or by reason of fire, floods, frosts, fogs, storms or any cause whatsoever beyond the control of the Charterer affecting mining, transportation, delivery and/or loading of the coal, not to be computed as part of the loading time (unless any cargo be actually loaded during such time). In the event of any stoppage or stoppages arising from any of these causes continuing for the period of six running days from the time of the vessel's being ready to load, this Charter shall become null and void, provided, however, that no cargo shall have been shipped on board the vessel previous to such stoppage or stoppages. In case of partial holiday, or partial stoppage of colliery, collieries or railway from any or either of the aforenamed causes, the lay-days to be extended proportionately to the diminution of output arising from such partial holiday or stoppage. If longer detained, Charterer to pay U.S. Currency per running day (or pro rata for part thereof) demurrage. If sooner dispatched, vessel to pay Charterer or his agents U.S. Currency per day (or pro rata for part thereof) dispatch money for time saved. No deduction of time shall be allowed for stoppage, unless due notice be given at the time to the master or Owner.

5. If any dispute or difference should arise under this Charter, same to be referred to three parties in the City of New York, one to be appointed by each of the parties hereto, the third by the two so chosen, and their decision, or that of any two of them, shall be final and binding, and this agreement may, for enforcing the same, be made a rule of Court. Said three parties to be commercial men.

6. The cargo to be loaded, dumped and trimmed by men appointed by the Charterer at the tariff rate of the port at vessel's expense.

7. The bills of lading shall be prepared in accordance with the dock or railway weight and shall be endorsed by the master, agent or Owner, weight unknown, freight and all conditions as per this Charter, such bills of lading to be signed at the Charterer's or shipper's office within twenty-four hours after the vessel is loaded. Master shall sign a certificate stating that the weight of the cargo loaded is in accordance with railway weight certificate. Charterer is to hold Owner harmless should any shortage occur.

8. The Act of God, the king's enemies, restraints of princes and rulers, and perils of the sea excepted. Also fire, barratry of the master and crew, pirates, collisions, strandings and accidents of navigation, or latent defects in or accidents to, hull and/or machinery and/or boilers always excepted, even when occasioned by the negligence, default or error in judgment of the pilot, master, mariners or other persons employed by the shipowner, or for whose acts he is responsible, not resulting, however, in any case from want of due diligence by the Owner of the ship, or by the ship's husband or manager. Charterer not answerable for any negligence, default, or error in judgment of trimmers or stevedores employed in loading or discharging the cargo. The vessel has liberty to call at any ports in any order, to sail without pilots, to tow and assist vessels in distress, and to deviate for the purpose of saving life or property, and to bunker.

9. The cargo to be discharged by consignee at port of discharge, free of expense and risk to the vessel, at the average rate of tons per day, weather permitting, Sundays and holidays and after noon on Saturdays excepted provided vessel can deliver it at this rate. If longer detained, consignee to pay vessel demurrage at the rate of U.S. currency per running day (or pro rata for part thereof). If sooner dispatched, vessel to pay Charterer or his agents U.S. currency per day (or pro rata for part thereof) dispatch money for time saved. Time to commence twenty-four (24) hours, Sundays and holidays excepted, after vessel is ready to unload and written notice given, whether in berth or not, even if vessel is already on demurrage, and the time allowable for discharging to be calculated on the basis of the bill of lading quantity. In case

of strikes, lockouts, civil commotions, or any other causes or accidents beyond the control of the consignee which prevent or delay the discharging such time is not to count unless the vessel is already on demurrage.

10. Notice at port of discharge to be given in writing to consignee's agent on working days between the hours of 9 a.m. and 5 p.m., and 9 a.m. and noon on Saturdays.

11. Shifting time from anchorage place to loading or discharging berth is not to count even if vessel is already on demurrage.

12. Opening and closing of hatches at commencement and completion of loading and discharging shall be for Owner's account and time used is not to count.

13. Lighterage, if any, at discharge port to be at the risk and expense of consignees and time used to count as laytime.

14. In case of average, the same to be settled according to York/Antwerp Rules 1974. Should the vessel put into any port or ports leaky or with damage, the captain or Owner shall, without delay, inform the Charterer thereof. Captain to telegraph Charterer in case of putting in anywhere.

15. Vessel not to tender before 9 a.m. on   and if vessel be not ready at loading port as ordered before 9 a.m. on   , or if any wilful misrepresentation be made respecting the size, position or state of the vessel. Charterer to have the option of cancelling this Charter, such option to be declared on notice of readiness being given.

16. Vessel to be consigned to   agents at port of loading, and to   agents at port of discharge.

17. Overtime is to be for account of party ordering same. However, if ordered by port authorities, same is to be for Charterer's account Officers' and crew overtime expenses to be for Owner's account.

18. Extra insurance, if any, due to vessel's age, flag, classification or ownership shall be for Owner's account.

19. No cargo is to be loaded in deeptanks or similar places inaccessible to reach by grabs.

20. Any damage by stevedores shall be settled directly between Owner and stevedores.

21. Owner shall, at his risk and expense, comply with all applicable rules, regulations and laws relevant to water and/or air pollution at ports of loading and discharging. In cases where vessel calls at a U.S. port, Owner warrants to have secured and carry on board the vessel a Certificate of Financial Responsibility as required under U.S. law.

22. All bills of lading shall include the following three clauses:

NEW JASON CLAUSE: In the event of accident, danger, damage or disaster before or after commencement of the voyage, resulting from any cause whatsoever, whether due to negligence or not, for which, or for the consequences of which, the carrier is not responsible, by statute, contract or otherwise, the goods, shippers, consignees or owners of the goods shall contribute with the carrier in general average to the payment of any sacrifices, losses or expenses of a general average nature that may be made or incurred, and shall pay salvage and special charges incurred in respect of the goods.

If a salving ship is owned or operated by the carrier, salvage shall be paid for as fully as if such salving ship or ships belonged to strangers. Such deposit as the carrier or his agents may deem sufficient to cover the estimated contribution of the goods, and any salvage and special charges thereon shall, if required, be made by the goods, shippers, consignees or owners of the goods to the carrier before delivery.

CLAUSE PARAMOUNT: This bill of lading shall have effect subject to the provisions of the Carriage of Goods by Sea Act of the United States, approved April 16th, 1936, which shall be deemed to be incorporated herein, and nothing herein contained shall be deemed a surrender by the carrier of any of its rights or immunities or an increase of any of its responsibilities or liabilities under said Act. If any terms of this bill of lading be repugnant to said Act to any extent, such term shall be void to that extent but no further.

NEW BOTH-TO-BLAME COLLISION CLAUSE: If the ship comes into collision with another ship as a result of the negligence of the other ship and any act, neglect or default of the master, mariner, pilot or the servants of the carrier in the navigation or in the management of the ship, the owners of the goods carried hereunder will indemnify the carrier against all loss or liability to the other or non-carrying ship or her owners in so far as such loss or liability represents loss of, or damage to, or any claim whatsoever of the owners of said goods, paid or payable by the other or non-carrying ship or her owners to the owners of said goods and set off, recouped or recovered by the other or non-carrying ship or her owners as part of their claim against the carrying ship or carrier.

The foregoing provisions shall also apply where the owners, operators or those in charge of any ship or ships or objects other than, or in addition to, the colliding ships or objects are at fault in respect to a collision or contact.

23. PROTECTION & INDEMNITY BUNKERING CLAUSE: The vessel in addition to all other liberties shall have liberty as part of the contract voyage and at any stage thereof to proceed to any port or ports whatsoever whether such ports are on or off the direct and/or customary route or routes to the ports of loading or discharge named in this Charter and there take oil bunkers in any quantity in the discretion of Owners even to the full capacity of fuel tanks, deep tanks and any other compartment in which oil can be carried whether such amount is or is not required for the chartered voyage.

24. C.S.U.K. WAR RISKS CLAUSES 1 & 2: No bills of lading to be signed for any blockaded port and if the port of discharge be declared blockaded after bills of lading have been signed, or if the port to which the ship has been ordered to discharge either on signing bills of lading or thereafter be one to which the ship is or shall be prohibited from going by the government of the nation under whose flag the ship sails or by any other government, the Owner shall discharge the cargo at any other port covered by this Charter Party as ordered by the Charterers (provided such other port is not a blockaded or prohibited port as above mentioned) and shall be entitled to freight as if the ship had discharged at the port or ports of discharge to which she was originally ordered.

The ship shall have liberty to comply with any orders or directions as to departure, arrival, routes, ports of call, stoppages, destination, delivery or otherwise howsoever given by the government of the nation under whose flag the vessel sails or any department thereof, or any person acting or purporting to act with the authority of such government or of any department thereof, or by any committee or person having, under the terms of the war risks insurance on the ship the right to give such orders or directions and if by reason of and in compliance with any such orders or directions anything is done or is not done, the same shall not be deemed a deviation, and delivery in accordance with such orders or directions shall be a fulfillment of the contract voyage and the freight shall be payable accordingly.

25. Charterer shall have the privilege of transferring part or whole of the Charter Party to others, Charterer guaranteeing to the Owner due fulfillment of this Charter Party.

26. The Charterer's liability shall cease as soon as the cargo is shipped, and the freight, dead freight and demurrage in loading (if any) are paid, the Owner having a lien on the cargo for freight, demurrage and average.

27. Penalty for non-performance of this agreement, proved damages, not exceeding the estimated amount of freight.

28. An address commission of   percent on the gross amount of freight, dead freight and demurrage is due by the vessel and Owner to the Charterer on payment of freight.

29. A commission of   percent on the gross amount of freight, dead freight and demurrage is due on payment of freight by the vessel and Owner to

APPENDIX II

Additional Material Submitted for the Record

ENVIRONMENTAL POLICY CENTER
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REVIEW OF THE DRAFT REPORT

WESTPO'S

AN EXAMINATION OF THE INSTITUTIONAL AND REGULATORY FACTORS THAT MAY INFLUENCE THE EXPANSION OF WESTERN COAL EXPORTS

ED GRANDIS

The Environmental Policy Center appreciates the opportunity afforded us by WESTPO to comment on the WESTPO Coal Report which analyzes the range of social, economic and environmental impacts likely to occur in the event of expanded exports of western U.S. coal. We would like to commend the western governors for their commitment through this endeavor to attempt to analyze and forecast potential trouble spots in advance of actual occurrence.

It is our assessment that actual coal exports from the western states, while increasing over time, will not reach the high levels assumed in the ICE Report and we commend WESTPO for what we consider a more realistic forecast of likely production for export. A major concern of the Environmental Policy Center is that the western governors accurately identify the real causes for the shortfalls in coal exports if and when they occur. It is our finding that the factors contributing to western coal export shortfalls, from ICE-type projections, will not be caused by the implementation of key environmental and health and safety laws, but rather will be caused by problems of demand, financing, competition and transportation infrastructure. While it is conceivable that particular mining sites, transportation corridors and systems and port selections may be eliminated, altered or specifically selected on the basis of environmental laws and regulations, it is our conclusion that the vast availaibility of western coal relative to the actual demand for it in the export market will provide the coal industry, western states and citizen interests considerable flexibility in making the most environmentally sensitive choices.

Finally, it is our assessment that the least controversial path to western coal exports is one which keeps in place the key environmental and health and safety laws. Perhaps the singular serious flaw in this otherwise excellent WESTPO Coal Report is the failure to give recognition to actual events occurring within the Reagan Administration to systemmatically dismantle the federal coal leasing program, the federal strip mine law, and the clean air act, to name only those key laws on which specific actions have been taken. The political strategy of the Reagan Administration to destroy the effectiveness of key environmental laws is on a collision course with an orderly, stable expansion of western coal exports in that it is certain to stimulate new controversies throughout the coal production system. While the actions of the Reagan Administration do not necessarily reflect the views of individual states, and in most cases are in stark contrast to the environmental commitments of a number of western governors, it is nonetheless crucial that the WESTPO Coal Report analyze the range of impacts the Reagan anti-environment policies will have on western coal exports.

Chapter 1. -- Introduction

A. Purpose --

We concur with the statement -- Energy projects were delayed due to the "uncertainty on the part of the project sponsors who were not firmly committed to the endeavor."

However, it must be recognized that certain areas of the west, coal development will be prohibited to the lack of current technology to reclaim the land or substantial water loss (quality and quantity) will result.

Chapter 2. -- Background and Perspectives

A. Review of Major Factors --

Figure 0.0 -- Need to consider pre-mining use of area and how that may impact contiguous areas.

Environmental Regulations and Permits --
Mining. --

We are concerned that this report inadequately considers the negative impacts the Reagan Administration is and will have on the implementation of the federal laws. In each of the areas that are mentioned (EPA, OSM, and BLM) the federal role is being redefined. These changes will hinder the federal government in satisfying their legal responsibilities. Public acceptance of coal has only occured due to the legal mechanisms that have been instituted during the 1970's which have made coal a viable energy alternative. Even under the restraints imposed coal production has significantly increased. This trend will be hampered by the present actions of the Department of Interior and other federal agencies. This study will be seriously flawed unless these policy initiatives are considered and analyzed. We have supported increase coal production and will continue to do so as long as these cornerstones are protected:

1. Mine Health and Safety
2. Federal Coal Leasing Program
3. Federal Strip Mine Reclamation Program
4. Clean Air and Water Regulation

If these standards are chipped away, public support will quickly erode.

P. 2-14, chart

We recommend that reclamation in the arid west may in fact be a barrier. Long term reclamation has yet to be proven in this region and certain tracts may have to be avoided. However, we agree that total coal production to meet both domestic and export need will be available.

P. 2-16, chart - same concern as on p. 2-14.

Air Quality --
Mining. --

The material seems to mix local impact with national impact. Should be rewritten to separate and distinguish between local and national.

Also, the materials suggest that OSM regulates air quality. This is an accurate assessment. OSM decided not to regulate air quality except in the west and only on certain large operations. Additionally, OSM's provisions in this area are discretionary not mandatory.

Water Resources
Mining. --

We agree that the significant "water requirement...may make reclamation impractical in some areas."

P.2-23
Ecology chart--

OSM studies and other federal reports indicate that reclamation may be a potential barrier in some areas.

VII. Environmental Regulations Pertinent to Western Coal Development

This section fails to acknowledge that NEPA is not applicable to states unless the activity is on federal lands. However, current plans of the Reagan Administration is to allow the states substantial authority on mine plan review while not requiring NEPA review by the federal agency.

P. VII-5

As mentioned previously OSM's air regulations are only applicable to large western mines.

Basis Regulations of the Coal Industry --

One of the basic concerns we have with this report that it fails to address the responsibility that we shoulder in insuring that exported coal is utilized in an environmentally sound manner. In other words, we do not support a coal policy that encourages dumping "dirty" coal on our allies. WESTPO needs to examine the potential foreign markets and determine what legal restraints are available to insure coal is burned in an environmentally sound way. If not, we need to use our leverage to protect the residents of the importing countries and in fact the world from the atmospheric impacts resulting from the significant increase of coal utilization.

P. VII-15
Reclamation

This draft needs to portray accurately OSM regulations. OSM s regs. are not 400 pages long. They are closer to 125 pages. There seems to be a bias against OSM in this report. While the states have had a difficult relationship the report should reflect facts not bias.

P. VII-16

OSM's regulations are undergoing a major overhaul. It is our opinion that they are being gutted. Regardless of perspective, it is fair to say that the federal government will be less effective in controlling coal mining abuses. This will require more responsibility upon the states if they are to convince their residents that increased coal production will not substantially impact agricultural and other economic and aesthetic resources. As noted, above we belive that this report will be incomplete without addressing this issue.

P. VII-38
Current Trends --

Once again this report is inaccurate in its analysis of OSM. We strongly urge WESTPO to revise its materials on OSM to reflect the current situation. Unless this is done, the report will be open to criticism that will diminish the quality of your recommendations. The state prgram process was delayed by court action and while 16 states received primacy under Secretary Andrus, eight states (in the east and mid-west) were enjoined from resubmitting by various court orders.

P. VII-65
Current Trends --

Once again this report glosses over the detrimental impacts of the Reagan Administration. While we support the efforts to streamline and eliminate duplication between the federal government, its agencies, and the states, this is not to be interpreted that federal laws are to be ignored or inadequately implemented. This report must address the serious problems that are being caused by the new policy initiatives.

P. VII-66
Surface Mining Control and Reclamation Act of 1977--

As noted above, the reports on OSM are inaccurate and outdated by many months. This section needs to be completely rewritten. No fair analysis of coal export can be made without factoring in the activities regarding coal policy of the Reagan Administration.

P. VII-68

The case study has inaccurate information regarding AFV regulation.

P. VIII-13

The table on severance taxes is inaccurate.

P. VIII-18
Reclamation --

The introduction is written as if mining abuses are no longer occurring This is grossly inaccurate. We must stop apologising for the coal industry. The coal industry as a whole is only complying to those regulations that are implemented by the state within they operate. Vast differences in mining and relamation is still occuring nationwide. Also, while successful reclamation is being achieved in some areas, reclamation is still unproven in the arid areas of the west.

P. VIII-20
Reclamation Cost --

Totally Subjective. The comment that all mining operations must have state permits since May 3, 1978 is inaccurate. Also, does not distinguish between cost of backfilling and grading, and revegetation. Bias again creeps in with statement that Carter used Act as a weapon.

P.VIII-23
Regulations and Penalties --

Statement that some environmental regulations raised the costs of using coal "unnecessarily" is misleading and unsubstantiated. It is rhetoric such as this which diminishes the quality of the report and allows for unnecessary criticism.

Over the last several years industry complained that regulations were too costly. We have consistantly requested for specifics, only to be supplied with hypothetical situations. This material does the rest of the report an injustice. We recommend deleting or proving.

V. PORTS

Policy Statement
Perils to Our Nation's Greatest Estuaries

Generally, the environmental damage from harbor deepening is directly related to the amount of dredging required and to the types of sediments which have to be dredged. Those ports which are naturally deep, therefore, would generally have fewer problems associated with becoming coal ports. Port in the Southeastern U.S. and along the Gulf of Mexico, which are very shallow, would involve much more severe impacts, and generally far greater maintenance costs. Some West Coast prots have significant environmental advantages because they are naturally deep. However, some like Grays Harbor in the State of Washington would involve very significant environmental problems. Conservationists have objected to the destruction of wetlands associated with harbor expansion for Weyerhauser Paper Company long before there was discussion of coal port development. Because of the generally superior environmental quality of this harbor serious environmental objections will be raised in connection with coal port expansion.

Not a lot of information has been presented to Congress with respect to environmental problems associated with Western port development. However, when we look to proposed harbor expansions in the East the following problems have been identified.

We are deeply concerned by the headlong rush to deepen harbors for coal exports because the health of some of our nation's greatest estuarine areas is at stake. Congress should exercise extreme caution lest irreparable harm be done to the productivity of our outstanding fisheries. Already our major rivers and harbors are under heavy stress. The Corps maintains some 300 channels, dredging roughly 300 million cubic yards of spoil annually. The adverse impacts of dredging include contamination of bays from toxic dredge spoil, contamination of spoil disposal sites, contamination of aquifers, loss of wetlands, loss of fin and shellfish nursery areas, and destruction of habitats heavily utilized by migratory waterfowl.

For example, on the East Coast, plans for disposal of spoil in Mobile Bay could eliminate 5% of the Bay area which is less than 6-feet deep. This area provides a vital habitat for a significant portion of the commercial and sport fisheries along the Alabama coast. The bottom sediments in harbor at Norfolk-Hampton Roads are heavily contaminated with a range of deadly chemicals. Dredging at Norfolk could adversely affect circulation patterns in the lower Chesapeake Bay and harm productive oyster beds. The impact of a deepened channel to the Atlantic from the Bay is not well-known.

The 50-foot channel project for Baltimore involves more than dredging Baltimore Harbor. It involves dredging down to the Bay Bridge, plus the Rappahannock Shoals, the York Spit, and the Cape Henry Channel at the entrance to the Bay. An astounding 70 million cubic yards of material will have to be dredged. Some spoil will be dumped overboard, and the impacts of such dredging in the Bay are not well-enough known. Dredge material from Baltimore Harbor is heavily contaminated with toxic material and would be transported into the Chesapeake and put in a dike at the Hart-Miller Island site.

If the Harbor is to be dredged at all, we have urged that the spoil be placed at sites within the harbor so as not to risk the seepage of toxic pollutants into the Bay. One major worry concerns the alteration of salinity patterns in the Bay. A recent Corps study suggest that additional channel depths will result in a dispersion of toxic sediments from Baltimore Harbor into the Bay. Harbor deepening could change the mixing patterns in such a way that toxics are no longer trapped within the Harbor as they are at present.

The Corps does not have enough information on environmental impacts to proceed further with this project. The stakes are far too high if the Corps turns out to be wrong.

These are some of the problems that should be addressed for West Coast ports that would be involved in coal export for Japan.

Fast Track Bills Would Short Circuit Environmental Review

Several pending bills to deepen harbors would give the Army Corps the sole responsibility for determining environmental impacts of its projects and would, for all practical purposes, wipe out the congressionally-mandated role given to other agencies under the Clean Water Act, NEPA, the Endangered Species Act, and the Fish and Wildlife Coordination Act.

Some of the legislation would put Congress in the position of having to review environmental impact statements within 60 days of receipt--a very questionable procedure. Some legislation would restrict citizen access to the courts.

We question whether environmental problems are the primary cause of the delays of harbor projects. Some claim the delays average over 24 years. Since NEPA has been in existence for only a decade, the blame could not rest entirely there. We are not opposed to proceeding with economically sound projects which have been carefully reviewed for environmental impacts and which have appropriate environmental mitigation. However, the fast track approach taken in H.R. 55 and H.R. 2249 is totally unacceptable since it would eliminate the safeguards which have been carefully crafted to protect important natural resources along our coasts.

Global Environmental Impacts

In the rush to export coal, some consideration should be given to the desirability of promoting huge increases in worldwide burning of coal. The Global 200 Report issued in January of this year by the Council on Environmental Quality cautioned that large-scale burning of coal and other fossil fuels could double carbon dioxide in the atmosphere over preindustrial levels. This could then raise the temperature at the North Pole by 7 to 10 degrees centigrade. Such a temperature increase could lead to melting of the polar icecap and the drowning of coastal cities around the world. The Global 2000 Report ought to be seriously considered by Congress in its deliberations on energy matters and on coal port development.

EPC wishes to pose a question about the desirability of ports worldwide going to 56-foot depths. What will this mean to marine environments all around the world, especially in those areas where environmental safeguards are not likely to receive much attention?

Huge Drain on U.S. Treasury with Race by Ports to Become the Deepest

According to the Office of Technology Assessment, the cost of deepening just four ports--Mobile, Norfolk (Hampton Roads), New Orleans-Baton Rouge, and Baltimore--is a staggering $1.5 billion. Furthermore, annual maintenance costs can be extraordinarily high with the annual cost of maintenance at New Orleans-Baton Rouge projected at $75 million.

Given these huge costs, legislation to put such projects on a fast track without user fees will impose a large burden on taxpayers and areas of the country which are seeking help on other water resource matters. We are currently spending over $4 billion annually for water resource development projects across the country. Just a handful of projects take up a large amount of the annual construction budget and will continue to do so for most of the decade. If just four harbor projects costing $1.5 billion are put into the budget, many other water projects will be squeezed out in these tight budget times. Can our present water development budget accommodate the enormous financial burden of all the proposed harbor deepening? Some of the pending legislation (H.R. 55 and 2249) would authorize whatever sums are necessary to carry out any port or canal project which the Army Corps deems justified and in the national interest. The price of this virtual blank check would be in the billions.

Other legislation now pending (S. 1094) would set just as bad a precedent by authorizing reimbursement for harbor projects which local interests have gone ahead with on their own after only the most cursory review by federal interests. Such legislation would circumvent essential environmental review and would prevent ports from being examined as part of an overall national policy in which top priority projects were built first. The bill itself would make the following harbors eligible for reimbursement: Galveston, Corpus Christi, Brazos Island, Houston Ship Channel, Norfolk, and Brunswick Island.

Support for User Fees for Ports

EPC has for many years urged Congress to enact legislation providing for greater cost sharing on the part of beneficiaries of federal water resource development projects. The Reagan Administration has proposed sound legislation (H.R. 2962 and S. 810) for full cost recovery of all harbor maintenance and new harbor projects, and we favor enactment of such legislation with some slight modification to allow for a phase-in of fees for maintenance. We also favor requiring a good portion of the money for construction to be provided by non-federal interests concurrently with construction.

The best test of the economic merits of a given project is the willingness of the beneficiaries to pay back the costs, or better still, to provide funds concurrently with project construction. Waterway user fees which recover all the costs of construction and maintenance help promote economic efficiency and help avoid unsound projects, all of which translates into a savings of resources. The General Accounting Office and independent audits of Corps projects confirm that the benefit-cost analysis needs substantial improvement to rid it of unrealistic assumptions. As the Corps attempts to accommodate various navigation interests, it is important to have a check on how realistic claimed benefits are. The user fee provides this crucial check.

Types of User Fees

For deep-draft harbors we support user fees which recover costs on a port-by-port basis, as the Administration bill recommends. Furthermore, it is important that within each port user fees be assessed in such a manner as to impose user fees on each vessel in proportion to the expense the port incurs as a result of servicing that vessel. This would normally mean that the deeper the vessel's draft, the greater the fee. In particular, the cost of the extra dredging necessitated by big coal ships should fall specifically on these ships.

For harbor deepening projects the existence of user charges will help to ensure that alternative are fully explored and that a sound choice is made between dredging to 55 feet and alternative technologies to dredging described in the Office of Technology Assessment report, Coal Exports and Port Development. OTA discusses a number of alternative to harbor deepening. These include pneumatic pipelines, shallow-draft wide-beam ships, midstream transfer of barges or ships, and barge-carrying ships . Without adequate user fees we do not believe these alternatives, which may be much more environmentally desirable, will be seriously considered.

In the absence of inland and deep-draft waterway user fees U.S. taxpayers will be subsidizing foreign energy consumption.

No New Port Legislation Without User Fees

EPC is opposed to enactment of any new harbor expansion legislation before full recovery deep-draft waterway user fees go into effect.

Reasons for Current Delays at Coal Ports

The Interim Report of the Interagency Coal Export Task Force (ICE Report) said the following about the current backlog at U.S. coal ports:

> The immediate hindrance to expanding the United States' role in international steam coal trade is our limited capacity to store and load coal at the ports....The principal problem underlying the port backlogs of 1980 was that existing facilities and methods for moving coal to the ports, designed for metallurgical coal, were overtaxed by the surge of demand directed toward the United States.... Given an absence of ground storage at the ports, shippers were simply unable to maintain or move the volumes of steam coal necessary to fill orders and load ships. Waiting ships were not accepted for loading until all the coal ordered was on hand. Even if the necessary coal had been available at the port loading areas, then another bottleneck would have developed, because the capacity of piers and loading equipment was also inadequate.

Furthermore, the ICE Report asserts:

> Channel depth at the ports did not in itself play a primary role in the problem

Questionable Nature of Projections of Coal Export Boom

Joel Price, investment analyst for the Houston energy firm of Rotan Mosel, Inc. and publisher of the Coal Observer, testified before the Senate Environment and Public Works Committee that the nation is over-reacting to the line-up of ships seeking coal. People have not examined as closely as they should how fast new powerplants will come on line in Europe. A careful analysis shows that demand for coal is much slower than we originally thought. The expansion plans for better loading and handling of the coal will be so great that by 1985 Price foresees that will will have an additional 105 million tons of loading capacity on the East Coast but only 17-20 million tons of additional demand. By 1990 only 29-34 million tons, or just 30% of the capacity, will be moving. These are suicide economics, he asserts, and we shouldn't make them worse by dredging because dredging simply adds more capacity on top of this excess. Why is demand only going to be this great? First, if Australia plays its cards right, we can't beat it in the Pacific but neither can Australia beat us in the Atlantic. In the Atlantic, the competition is between South Africa and the United States. Because Poland has internal difficulties, it is not likely to be much of a factor in additional coal for some time. In competition with South Africa we cannot win. It can undersell us "with its eyes closed", according to Price. But no importer is going to rely solely on a country like South Africa for its supply. Other countries will come to the U.S. because they will insist on a diversity of suppliers.

What this means is that we will have a certain share of the European coal market regardless of what we do, but that we won't have as much as the Corps' predictions claim.

So the answer to whether the coal boom will really come off as projected is that we are seriously overextending ourselves by building too much capacity. The answer to whether we need greater channel depths to capture the international market is this: you don't need greater channel depth to have coal exports. Get the loading facilities ready and you will have some of the market because Europe will always come to us for some of its coal. But be careful because the market is not going to be as big as people think.

In conclusion, we have a highly questionable economic rationale for the harbor deepening, especially in view of the large unknown impacts on America's great estuaries.

Balance of Payments/Security of U.S. Allies

One final set of arguments for coal exports should be addressed. It is argued that we need coal exports to help our balance of payments situation. The primary cause of our adverse balance of payments is our oil imports. By setting new mileage standards for 1990 for trucks and automobiles we can far more effectively do something about this problem. In regard to the claim that exporting coal provides energy security to our allies, EPC point out that if our allies need coal from us all they will have to do is ask and there are plenty of sellers and with the new loading facilities the coal will be there without any additional dredging or harbor deepening.

SPECIFIC COMMENTS ON PART V PORTS SECTION

Before beginning specific comments on Part V we would like to commend the workmanship that went into presenting the specific picture on the West Coast Ports. This, combined with the report that was put together by the Association of American Railroads, "A Summary of Existing Physical Characteristics of U.S. Coal Export Facilities with a Review of Proposed Facility Expansions", gives the most accurate picture to date as to what is proposed in the nature of coal ports for this country. The level of detail was quite sufficient in laying out the picture as we understood it. The above policy statement on coal ports provides the concerns that we have in general with coal port development. As you stated in your report #5: "This situation also presents an opportunity that modern, state of the art material handling techniques can be incorporated in the design of the West Coast export terminals". We feel that this is at the heart of the matter with port development. If ports can be built and located in areas of benign environmental consequence, as well as economically stand on their own, then we say godspeed to them.

Pages 12, 13: We found the statement that coal yard air and water environmental controls (along with other incidentals), accounted for just 15% of capital costs of terminal development, rather interesting. Environmental costs are always painted as the boogeyman when it comes to development. You have put them into perspective. The same holds true for the dredging costs (along with incidentals) accounting for 10% of the costs.

Page 15: This section, regarding time required for development, was most interesting. The time required for the permitting process accounts for 20 to 30% of the total time from start to finish for a project. We don't view this as burdensome, given the consequences of unchecked development in highly fragile areas. The other key point here is the fact that this time could be condensed by developers if they were willing to expend funds on detail engineering prior to completion of the permit process.

Page 22: In the last paragraph you state: "In an active harbor area or in coastal areas with wave, wind, and current action, it is expected that natural flushing would minimize increases in turbidity." Would this not depend on the amount of coal that is being moved through the harbor?

Pages 22,23: In reading through this section we have seen no mention of the effects of maintenance dredging that will have to take place in these port areas. We would suggest a discussion of these issues.

Pages 24,25: In the suggestion on water quality, we would hope that you include some discussion of the placement of coal facilities away from communities' water supply intake. If the community takes water from a groundwater system, they make sure that a thorough examination of the groundwater regime is undertaken where facilities are to be located. This foresight may prevent a "Love Canal" situation from developing down the road. There should also be some discussion of the potential impacts of dredging to greater depths such as impacts on aquifers (saltwater intrusion, etc. This was mentioned in some of the descriptions of California ports).

Page 25: We would hope that all facilities would have these provisions mentioned in the two paragraphs above point 4.

In the paragraph on Sanitary waste, there should be some other discussion of the waste from ships that are waiting in line for loading. This became quite a problem in the Hampton Roads, Virginia area earlier this year. There may be ports in the West that would lend them themselves to a similar occurence.

There has also been only a cursory discussion of the effects of runoff into the wetlands area of the terminals. We have elaborated on this point in our policy statement but would suggest that you review the material that has been presented to the various congressional committees on this matter in their consideration of the port bills.

Page 43: Your discussion of the dredging legislation is quite good. One of our concerns in this area is the way the Congress (Appropriations Committee in particular) is skirting the authorizing committees to move certain ports ahead of others in the quest to have one port out of the hopper before the others. We are opposed to such actions, since it removes the opportunity for projects to be examined equally, on their merits.

One other important point is that the Operation and Maintenance budget for the Corps of Engineers went over the billion dollar mark this year.

Page 85: We take exception to your discussion on Gray's Harbor. A long-range disposal plan for dredge spoil disposal was to have been prepared but has yet to be done by the Corps of Engineers. The Washington State Department of Ecology has called into question the impacts of this project on water quality, since a deeper channel may increase the flushing times, especially in the inner harbor area. The water quality could be lowered to the point that NPDES permits for the existing pulp mills in the harbor may have to be upgraded.

Page 110: This information should prove to be enlightening to the entities planning coal export on the West Coast. We would much rather see these ports used where harbor deepening does not have to be done.

Pages 130-162: In Chapter 5, we found no discussion on the value of cargo that was being hauled. There was an interesting statement on page 25 of the Office of Technology Assessment report of April 1981 on Coal Exports and Port Development which stated: "In 1980, the average cost of all coal at the port before shipping was $50/ton. For a 125,000-dead-weight ton fully loaded vessel, the cargo would, on average, be worth $6.25 million. We think that it is important to put costs into perspective with profits.

Pages 159-162: It was good to see the discussion of future shipping technologies here. These are the types of technologies that we would rather see put forth than to have harbor deependings taking place in fragile estuarine areas.

Page 161: The comment at the end of the first paragraph was most revealing. The fact that shipbuilders would rather forgo construction of these shallow draft vessels because they anticipate harbor deepenings to take place in the short term seems contrary to the opinions expressed by those involved, who believe that projects take too long to get underway. It would seem that time would be well spent changing this philosophy of the shallowdraft shipbuilder.

To: Joe Browder
From: John L. McCormick
Re: WESTPO Coal Export Study
Date: November 16, 1981

The Study included a comprehensive discussion of the various coal transportation modes and the benefits and impacts of each.

I found the chapter on the coal slurry pipeline option to be a detailed review but lacking in one essential element. It did not discuss adequately, the environmental problems associated with the discharge of the waste water after it is separated from the crushed coal at the terminus of the line.

The Black Mesa coal slurry pipeline - terminating at the Mohave Power Plant in Bullhead City, Nevada - has not been designed to accommodate waste water treatment facilities sufficient to allow discharge of the water. Instead, the utility has relied upon settling ponds to hold the partially and inadequately treated water. Given the arid climate and evaporation potential in that region, coupled with low costs for land acquisition, that is a realistic - though not preferrable - option for that company.

If a coal/water slurry pipeline were constructed and operated to move coal from the Northern Plains or Southwestern coal fields to seaports on the Northwest, a host of problems may occur. The WESTPO report did not discuss them and herein, the report is inadequate.

Assuming an ocean-going coal collier was harbored at a mono-bouy some distance from shore, the slurry would have to be pumped on board without the water having been separated. Therefore, the ship would have to cargo the waste water or separate it from the coal on board and transfer the waste water to a smaller ship for disposal on shore. Or, the waste water would be discharged directly into the ocean - a likely violation of Federal and State laws.

If the slurry water is separated on land, prior to delivery to the ship's cargo hold, between 30% and 40% of the water will remain with the crushed coal. This will displace significant amounts of coal and add to the shipping costs. Drying the coal may be expensive and pose hazards to the ship's crew as dried coal tends to combust spontaniously in enclosed areas.

Upon separation, the water will contain very high amounts of suspended solids, coal particles, and small amounts of salts, trace elements, sulfuric acid and anti-corrosive chemicals added to the slurry mix. Before being dischared, the waste water must be purged of most of these pollutants by mechanical means. Despite continued assurances by proponents of coal slurry pipelines being considered, there does not appear to be a reasonable probability that the industry can accomplish that cleanup to the degree required.

Furthermore, the treatment process may also require the addition of chemicals which, in turn, may have to be removed before discharge. Of course, the alternative to treatment is permanent or long-term storage in settling ponds. In the Long Beach area this would be a very expensive option but the climate would allow for significant evaporation. The Pacific Northwest rainfall and humid climate would make the settling pond option unrealistic, though land costs for permanent storage facilities would be lower.

In the absence of demonstrated proof by the proponents of slurry pipelines that water treatment technology exists, has been tested, and is economically feasible, the report should stress the risks to the environment in a forthright manner. Failure to take careful note of the waste water discharge problems associated with coal slurry pipeline operations will undermine the public acceptance of that technology. To date, the slurry pipeline industry can only offer assurances that the problems have technical solutions. If that is the case, the report should examine them in detail and offer that discussion to the public for further comment.

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PETROBRAS
Brazilian Petroleum, S.A.

THE PROBLEMS OF GAS COAL IN BRAZIL

Roberto Garcia
Rio, May 28, 1980

RESERVES

Gas coal occurs at several points in Brazilian territory as can be seen in Figure 1. As to the type, we have from lignite to anthracite. Lignite is a geologically new coal, highly reactive, normally with a high humidity content, and does not lend itself to use in conventional siderurgy. The Brazilian lignite reserves located in Atalaia do Norte and Letícia, in the Upper Amazon, were discovered by Shell and as yet have not been calculated as to size. Those that occur in Pará, Goiás and Piauí are not commercially workable. Actually the significant reserves, known thus far in Brazil, are those located in the states of Paraná, Santa Catarina and Rio Grande do Sul, where the coals are of the bituminous and sub-bituminous types.

The reserves in Rio do Peixe, Paraná, are meanwhile, very small: scarcely 40 million tons . It involves underground mining and part of the reserve contains a high uranium content in the ashes, and the Nuclebrás is presently engaged in studying a way to extract this uranium.

In Santa Catarina, the carboniferous basin shows 3 superimposed layers of coal:

- Barro Branco layer
- Irapua layer
- Bonito layer

The Irapua layer, normally intermediate to the other two, has a very small reserve.

Generally speaking, the mining of the Barro Branco and Bonito layers has to be underground, although small portions do occur where it is possible to do strip mining. The upper layer is the Barro Branco, so called because of the presence of a layer of white clay next to the coal, and it is the only bearer of metallurgical coal that can be changed into coke. Its total reserve is 847 million tons and is, at the present time, the only stratus being mined.

Fig. 1 - Occurrences of gas coal in Brazil

[Names are place names]

Table 1 - Coal reserves in Brazil

Estado = State
Jazidas = Deposits
Ceu aberto = Strip mining
Mina subterranea = Underground mine
Camada = layer
Reservas = Reserves
Medida = Measured
Indicada = Indicated
Inferida = Estimated
Totais = Total
Total da jazida = Total deposit
Sub-total = Sub-total
Totais = Totals

The Bonito layer offers an appreciable reserve - 848 million tons - but, since it has a very low (20%) yield of metallurgical coal, miners have not taken an interest even in obtaining better knowledge concerning it. Thus, in 1976, during the beginning of the studies on coal by Petrobrás, with the necessity of having better data on the Bonito layer arising, Petrobras had to pay the costs for 11 bore holes in the Icara region. Other boring jobs (Project Gasifiable Bonito Coal) were done in 1977 by the CPRM through the DNPM in agreement with Petrobras for the same purpose, at which time 127 drillings were carried out.

The greatest part of our coal reserves are in Rio Grande do Sul, in a total of 14.05 billion tons of which nearly 568 million are susceptible to strip mining. Nevertheless, in none of the deposits known thus far by the RGS is there coal that can be changed into coke. In terms of energy reserves, the total Brazilian reserve, calculated at 15.796 billion tons, would be equivalent to 4.95 x 10^{10} barrels of petroleum, approximately Brazil's petroleum consumption for 130 years at the current levels.

One of the big problems with Brazilian coal is its extremely high ash content - see Table 2 - which almost always calls for beneficiation, so as to reduce the ash content, before industrial application.

The problem can be visualized in Figure 2.

TABLE 2 - PRINCIPAL CHARACTERISTICS OF BRAZILIAN RAW COALS

Carvão = Coal

Cinzas = Ashes

Enxôfre = Sulphur

Umidade = Humidity

Poder calorífico KCAL/KG = Thermal value (kilocarlories/kilogram)

Em base seca = on a dry basis)

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ANALYSIS OF RAW GAS COAL (ROM) Figure 2

Leganda = Legenda

Rejeito = reject

Carvão vapor = steam coal

Carvão metalúrgico = metallurgic coal

Carvão redutor = Reducing coal

Unidade = Unit

Tenelada = Tonelada

Redutor = Reductor

Total ROM = Total ROM

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MINERS AND PRODUCTION

In Santa Catarina there are 10 coal-mining companies, one of which is state-owned and 9 privately-owned. As can be seen in Table 3, the great majority of these produce small amounts of coal and, naturally, do not have the functional and financial structure to plunge into midterm large-scale production.

At the present time all the mines use the room-and-pillar method for underground mining, since only two companies (Prospera and Metropolitana) have mechanized systems of production. This method permits the recovery of, at the most,50% of the bed since it is imperative to leave pillars, containing unmined coal for supporting the roof. The alternative methid, the "longwall," permits an exploitation of 70% or more of the coalbed, in addition to providing greater productivity. However, with the exception of a small semi-mechanized longwall that has functioned in the Prospera Mining (state), the large majority of coal miners in Brazil have hesitated for long years to adopt this mining process for various reasons: lack of financial capability, lack of technical support, etc.

In Rio Grande do Sul there are only two coal mining companies: Copelmi (private) and the Cia. Riograndense de Mineração (state). The CRM has two mines: the surface mine of Candiota, which supplies coal only for the thermoelectric factory of Candiota, and the underground mine of Leão I, which supplies coal for the manufacture of cement and for thermoelectricity. At the present time a new CRM mine - Leão II - is being opened, whose production will be earmarked for the São Jerônimo Gasification Factory and the manufacture of cement. In this new mine the mechanized longwall mining process will be adopted for the first time.

COPELMI currently is mining the I_1F layer of the Charqueadas reserve. In this mine the ROM coal is washed and the highest quality fraction (ash content of 32.5%) is used as a reducer in the direct-reduction oven of Aços Finos Piratini [steel company]. The lowest grade fraction, with an ash content of 55%, serves as a thermoelectric fuel for the Charqueadas Thermoelectric Factory. COPELMI plans to open a new mine to meet the demand of COPESUL's coal furnaces and also the cement industry.

TABLE 3 - COAL MINERS OF SANTA CATARINA AND RIO GRANDE DO SUL AND THEIR PRODUCTION OUTLOOK.

Companhia mineradora = Mining company

Estado = State

SC = Santa Catarina

RS = Rio Grande do Sul

Previsão de produção util = Forecast for profitable production

Totais = Totals

Fonte = Source

Notas = Notes

Produção de 1979 foi a real segundo o CNP = 1979 production was actual according to the CNP

3980 mil t. de carvão em Candiota, 300 mil t. em Leão I =3980 thousand tons of coal in Candiota, 300 thousand tons in Leão I

A nova mina (Leão II) da CRM, etc. = CRM's new mine (Leão II) is supposed to go into regular production in 1985 with 1 million tons/year of useable coal.

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In Paraná there is only one mine - Cambuí - whose production is used in the furnaces of Klabin's cellulose factory and in the thermoelectric plant of Figueiras. Since the reserve is very small, the opening of new mines is not justified.

Coal production in Brazil has appeared to be growing slightly as can be seen by Table 4. In this table one can even observe the production estimates made by the MME in the Energy Balance Sheets of 1976, 1977, 1978 and 1979. As can be seen, the planning for the tonnage to be produced has varied incredibly from year to year. This type of estimates mirrors well the vagueness and lack of consistency of the government numbers in the area of coal, which causes a great insecurity in consumers - who do not know if there is really going to be coal and what the price is going to be - as well as the producers - who do not know if there will be consumption for greater production and what the market conditions will be.

In the area of metallurgic coal, our production in 1979 represented only 24% of the consumption and the forecast is for us to continue to depend neavily on importation, with our consumption being supposed to double in the next five years as Table 5 shows.

At the present time, the Brazilian energy program foresees that by 1985 we ought to be producing from coal the equivalent of 170 thousand barrels of oil a day. This amount is equal to nearly 27.5 million tons of steam coal, which means more than 5 times our present production. Just to open the mines necessary for taking care of this consumption, it would be necessary to invest nearly US$ 2.5 billion in around 22 new large mines, which gives an average of 3.7 plants per year until 1985. In additon to this, it is necessary to invest in borings, for the opening of the mines, over Cr. $2.5 billion since the network of borings already made does not furnish the information necessary for the planning and the opening of the above-mentioned mines. But, bearing in mind the small tonnage of the mining companies in operation today, it is deduced that this goal will be hard to reach.

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Table 4 - NATICNAL COAL PRODUCTION IN thousands of tons

Ano = Year

Balanco energético nacional = National energy balance sheet

Não inclui carvão metalúrgico = Does not include metallurgic coal

***** ***** ***** ***** ***** ***** ***** *****

Table 5 - ESTIMATES OF IMPORTATION OF METALLURGIC COAL

Ano = Year

Fonte: Balanco energético nacional = Source: National energy balance sheet

Note further that there is not a transportation system capable of providing an outlet for this planned production since the harbors and railroads available at the present time will not handle such volumes of coal.

NEW AREAS OF MINING

Recently the Mineral Resources Research Co. - CPRM - placed 6 new coal-mining areas on auction. These are:

Arroio da Sila)
Morro dos Conventos)Santa Catarina

Leao Norte 1
Leao Norte 2
Irui Bloco Central 1
Irui Bloco Central 2 Rio Grande do Sul
Seival (Candiota)
Hulha Negra (Candiota)

These areas, owned by the CPRM, should be reexamined by third parties. Appearing as candidates for these areas are the 43 companies in Table 6, among which the six first ones are multinationals, which shows the international interest in our coal.

Of all these areas the only ones susceptible to surface mining are the beds of Seival and Hulha Negra.

USES OF GAS COAL

Perhaps the most well-known use of coal is in the manufacture of coke for use in the steel blast furnaces. However, for this specific application, the coal has to be cokeable, which only occurs with a fraction of the Barro Branco coal from Santa Catarina (around 50% of the coal of the bed) and with the coal from Bonito (around 20% of the bed coal). Even so, this fraction still presents a rather high ash content, around 18.5%, which causes a productivity drop in the blast furnaces.

Coal which does not lend itself to the manufacturing of coke is called "steam coal" or "energy coal" and is found in the greater part of our reserves. This coal can have multiple applications as outlined in Figure 3.

***** ***** ***** ***** ***** ***** ***** ****

TABLE 6 - Companies that contended for the coal mining units on auction by the CPRM - 1980

1 - Shell do Brasil
2 - Hanna do Brasil
3 - Milder Kaiser
4 - Internacional de Engenharia

CRS - 8

5 - Cia. de Mineração Meridional
6 - Liquid Carbonic, S.A.
7 - Copelmi
8 - Carbonifera Treviso
9 - Cia. de Mineração de Carvão Barro Branco
10 - Mineração Próspera
11 - Urussanga
12 - Carbonífera Criciuma
13 - Cia. Carbonífera Catarinense
14 - Usiminas
15 - Grupo Votorantin
16 - Camargo Correa
17 - Construtora Mendes, Jr.
18 - Grupo Bozzano-Simonsen
19 - Cr. Almeida, S.A.
20 - CRM
21 - Copel
22 - Paulo Abib Eng.
23 - Andrade Gutierrez
24 - Sacomar Maquinas Ltda.
25 - Cia. Brasileira Carbonífera Araranguá
26 - Cambuí
27 - Werco - Cia. Industrial
28 - Itabira Agroindustrial
29 - Metanol - Pesquisa e Projetos de Carvao
30 - Riofinex do Brasil
31 - Veritas, S.A.
32 - Ceesa
33 - Cia. Administrativa Morro Vermelho
34 - Servix Engenharia
35 - Univel
36 - Sesenge
37 - Tridente
38 - Rudinax Export
39 - Seebla
40 - SSM Fomento Mineral

41 - Fábio Pentano Guimarães
42 - Cimota
43 - Cimimar (Grupo Matarazzo)

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FIGURE 3 - USES OF STEAM COAL

Geração de vapor e eletricidade = Generation of steam and electricity
Fabricação de cimento = Manufacture of cement
Locomotivas a carvão = Steam locomotives
Redução direta SR/LN = Direct reduction SR/LN
Coque moldado = Formcoke
Liquefação = Liquefaction
Gaseificação = Gasification
Carvão vapor = Steam coal
Ferro esponja = Sponge iron
Metanol = Methanol
Gasolina = Gasoline
Amônia = Ammonia
Síntese Fisher-Tropsch = Fisher-Tropsch synthesis
Gás combustível industrial = Industrial fuel gas
Gás de cidade = City gas
Geração de eletricidade em turbinas a gás = Generation of electricity in gas turbines

However, despite the multiple possibilities shown, the spectrum of uses in Brazil is still very limited, inasmuch as gasification, which opens up a greater number of options, has not yet been achieved.

In 1979 the use of coal was as is shown in Table 7.

TABLE 7 - STRUCTURE OF THE CONSUMPTION OF STEAM COAL IN BRAZIL IN 1979

CONSUMER	%
Thermoelectricity	62
Railroads	1
Cement, navigation, etc.	37

The best alternative for the use of domestic steam coal is, unquestionably, in the generation of electricity since it permits use at the mine's entrance, without the need for transporting the coal, and consequently, its ashes, long distances. In addition, it is very important to the nation to generate electricity based on coal, because:

i) the investments in the generation through coal are about 1/3 those needed for the generation of the same capacity using uranium, (see Table 8);

ii) the operating cost for the generation through coal is much less than through fuel oil, a kilocalorie of coal (unsubsidized) costing only 30% of the value of a kilocalorie of fuel oil (see Table 9);

iii) the price of coal -- by being abstracted from inflation, is constant, which has not been the case with petroleum, whose price has risen in recent years at a real rate, discounting world inflation, of nearly 3% a year;

iv) coal is a domestic raw material with the subsequent advantages of national security and savings of currency.

Eletrobras plans to expand its coal thermal generation only after a distant 1992, in the meantime providing for seven nuclear plants between 1980 and 1992.

The cement-producing field will be responsible in 1985 for the consumption of 2.68×10^6 equivalent tons of petroleum, which signifies a flight of capital of nearly US$ 442 million a year. A substantial part of this oil could be substituted by coal. However, there are various problems for this. On the business side, the present subsidy for fuel oil discourages the businessman from using coal, a material which is harder to handle and presents great supply difficulties. On the government side, the inexistence of a firm and coherent plan for the mining, transportation and use of coal tied in with the subsidy for oil greatly hinders the nation's direction towards settling on a large scale substitute for fuel oil.

TABLE 8 - INVESTMENTS IN THE GENERATION OF ELECTRICITY

	US $ / Kw Installed
Hydroelectricity	500-1000
Thermo-electricity with coal	900-1200
Nuclear thermo-electricity	3000

TABLE 9 - COST OF ENERGY IN BRAZIL (May 1980)

	US$ /Gcal
Gasoline "A "	68.7
Kerosene	38.0
Diesel	27.7
ATE fuel oil	8.6 /16.1(1)
BTE fuel oil	10.5 /17.1(1)
Natural gas	
- For fertilizers	2.7
- For petrochemistry	7.3
- For fuel	11.3
City gas	
- Rio de Janeiro	31.3(2)
Coal gas	
- C/2 gasifiers	19.3
- C/4 gasifiers	16.7
Petroleum	
- Light Irak Basrah (29.96)	20.5
- Sassan Iran (33.10)	22.4
- Saudi Arabia (light) (28.00)	19.1
- Algiers (38.21)	26.8
Coal	
- Santa Catarina steam coal (unsubsidized)	4.8
- Candiota coal (unsubsidized)	1.2

Notes: (1) actual cost to the country
(2) the raw material is subsidized naphtha

There is a protocol signed between the cement businessmen and the federal government calling for the total substitution of oil by coal by 1985. However, in addition to a substitution of this type being difficult to achieve technically, market and price uncertainties lead to the conclusion that this protocol will not be met.

The use of steam coal in locomotives is apparently not viable on a large scale and is today limited to the Tereza Cristina Railway.

Acos Finos Piratini [Piratini Refined Steels] has had an oven for seven years which uses steam coal with 30% ash in the SRLN direct reduction process.

The advantage of using this type of process is the possibility of using steam coal instead of metallurgic coal for the production of steel. There are, however, some technical problems related to the coal type and the SRLN process that only now are being solved. At the present time, Piratini Refined Steels uses coal from the COPELMI's Recreio mine, this coal coming from the same coal bed as Leao's.

GASIFICATION

The gasification of steam coal is also a big option for the use of this source of domestic energy. Beginning with gasification, a series of products can be obtained. Let us look briefly at each of them.

Coal gas, both that obtained in the Koppers-Totzek process and that obtained in the Lurgi process, can be used as a reducer in the Hyl and Midrex direct reduction processes, which have been in commercial operation for several years.

These processes furnish sponge iron, which takes the place of forged scrap iron in the electric furnaces of steel production. The production of this forged scrap iron substitute is highly desirable for forged scrap iron in Brazil has maintained a growing trend of scarcity with the subsequent hike in its price. Recent studies show that a coal gasification plant coupled with a Mildrex reduction furnace permits producing finished steel with a rate of return for the business of 6% a year, which, in terms of siderurgy appears to be very important.

From coal gas, methanol can be synthesized, in large units (5,000 t/d) in order to profit from the economy of scale, and this methanol could be used directly as a substitute for an automotive gas in a way similar to ethanol. Exhaustive performance tests of methanol-powered cars were made in 1976 by Volkswagen in Germany and in the United States at which time its viability was demonstrated.

In addition to the direct use of methanol in engines, Mobil Oil recently developed a process for the transformation of methanol into gasoline, which indicates that it is possible to obtain gasoline at a price of Cr$ 15.60/ liter, when the capital is repaid at the rate of 12% a year.

Another important use for methanol is as an energy vector in the production of city gas by means of steam reforming. Thus, coal energy could be transported long distances and would be viable for taking care of towns of relatively little importance.

By using synthetic gas, obtained in gasification, ammonia can also be produced. Studies made by Petrobras show that the final cost of ammonia, paying back the investment at a rate of 5%, is around US$ 360.50/ton. This price is actually very high if compared with the price of imported ammonia which is US$ 215/ ton. However, the price of ammonia produced from fuel oil (considering its actual cost to the nation of US$ 165/ton) attains, under the same conditions of remuneration of capital, US$ 358.30.

One other possibility of obtaining liquid fuels from coal is through the Fisher-Tropsch synthesis. This way was adopted by South Africa, which will produce, when the SASOL project is completely finished, nearly 107,000 barrels of oil a day, which should guarantee almost half that nation's oil consumption.

At the present time, the SASOL plant, phase II, is in the final setting-up stages, with production supposed to start yet in 1980. The investment in SASOL II, for the production of 50,000 barrels a day, was nearly US$ 3 billion and it is estimated that a barrel of synthetic oil will cost US$ 43. Comparing this price with that of the oil from some countries such as Algiers (US$ 38.21/barrel), Iran (US$ 34.45 bbl) and Libya (US$ 34.12/bbl), one can see see that the oil obtained from the Fisher-Tropsch synthesis is not as expensive as it appears at first glance. If a comparison were made with the prices attained on the "spot market", where oil, on a recent date, came to be quoted at US$ 42/bbl, one deduces that the option adopted by South Africa is quite reasonable.

One evidently and extremely important product in certain cases is fuel gas from coal. This fuel gas can be of high or average heat value. The gas of high heat value is normally known as SNG (synthetic natural gas) and it is only reasonable for it to be produced in localities where there is a tradition and/or facilities already set up for the consumption and transport of natural gas. This is the case, for example, in the United States, where there is a fantastic network of gas lines for the distribution of natural gas. However, in Brazil's case, SNG is not justified for several reasons:

- There is no network for the distribution of natural gas;

There is no tradition of use of natural gas in the country, except in very small areas of Bahia;

- The efficiency of the process for obtaining SNG from raw gas of coal is very low;

- The methanation process of coal gas has not yet been commercially proven.

However, the gas of average heat value can be used, both in industry and in city gas. As industrial gas there is no problem in its use, and its production cost is around US$ 21 Gcal, or US$ 33.65/bbl of equivalent oil, repaying the capital at 5% a year. It must be emphasized that this price refers to a desulfurized gas that has big advantages of being used in areas of great industrial concentration, for the level of atmospheric pollution could be greatly reduced by its use instead of the usual fuel oils that have up to 5% sulfur.

City gas, produced at the present time from naphtha, is sold to the consumer for US$ 31.30/Gcal, and this gas could be replaced by coal gas, a little different from the above-mentioned industrial gas at a price a little above US$ 21/Gcal.

The direct liquefaction of coal is a field under development at the present time and looks very promising for the Nineties, but today only pilot units and those for the demonstration of new processes are in existence.

PROJECTS UNDER STUDY BY PETROBRAS

Petrobras has already made three detailed studies of coal gasification. The first of these is a project for the production of 600 tons of ammonia in Rio Grande do Sul in association with the Cia Riograndense de Nitrogenados. The total investment for this project will be US$ 266 million, with Petrobras' share being US$ 168 million. The plant is supposed to be located in São Jeronimo, on the banks of the Jacui River.

The second is an alternative to the first and envisions the production of fuel gas to supply all of REFAP's demand for fuel oil. The savings of oil would be 2,800 barrels of oil a day and the total investment along the lines of US$ 137 million, including the São Jeronimo-REFAP gas line.

The third project would be in Tubarao, Santa Catarina, for the production of 520,000 tons of sponge iron a year, using the direct reduction of coal gas. This plant, a joint Petrobras-Sidebras undertaking, would take care of the demands for sponge iron of the Santainvest pipe factory, with the surplus sponge iron being placed on the market as a complement of the demand for forged scrap iron.

WORLD OUTLOOK

The large multinational oil companies have, in recent years, invested significantly in coal and other minerals. At the present time, 11 oil companies are holding, in the United States, 55.3 billion tons of coal, which represents 25% of the American recoverable reserves.

Let us look, briefly, at the action of each one of the large oil companies in the area of coal:

1). SHELL

- Shell is, at the present time, the owner of Seaway Coal Ohio, a company which produces nearly 3.6 million tons of coal a year.

- This year a new mine, owned by it, is supposed to go into operation in South Africa, which will be producing another 3 million tons a year.

- In addition to this, Shell is prospecting for coal in Canada, Botswana and Swaziland.

- In Brazil, Shell discovered the lignite in Atalaia do Norte, in the Upper Amazons, in 1974, and was an applicant for the areas placed in licitation by the CPRM.

- In the area of technology, Shell is developing the Shell-Koppers coal gasification process, which already has one demonstration unit of 150 tons/per day of coal. This plant is functioning in Harburg, Germany, and is supposed to furnish planning data for the first industrial plant which is supposed to be built in Holland around 1985.

2). EXXON CORPORATION

- Today Exxon is holding the fourth largest coal reserve in the United States, with 9.3 billion tons of coal.

- Exxon is acting, in the coal area, through its two subsidiaries: Carter Oil Co. and Monterey Coal Co. These two companies produced 5.2 million tons of coal in 1979 and they plan to produce 36 million in 1985.

3). MOBIL CORPORATION

- They hold a reserve of 3.7 billion tons of coal.

- At the present time it isn't yet producing anything, but it is expected that in 1985 a minimum of 15 million tons a year will be produced.

- Mobil is developing the Mobil process for the production of gasoline from coal methanol.

4). GULF OIL CORPORATION

- Is the owner of the Pittsburg & Midway Coal Mining Co., which in 1979 produced 8 million tons of coal. An expansion is underway, aiming at increasing the production to 25 million a year within six years.

- It is developing the process of liquefaction of Solvent Refined Coal.

- It is also developing a new production process for gas of low heat value.

5). TEXACO

- Is developing the Texaco coal gasification process, and already has a demonstration plant in operation in Germany.

6). OCCIDENTAL PETROLEUM

Is the owner of the largest American coal company: Island Creek.

7). BRITISH PETROLEUM

- Purchased Old Ben Coal (Illinois, Indiana and Virginia), whose production in 1976 was 8.1 million tons.

- Took over the Clutha Project, New South Wales, Australia, for US$ 390 million.

- Is a partner in the Ermelo Coal Project in South Africa.

8). CONOCO

- Owner of the second largest American coal company: Consolidation Coal.

- Consolidation Coal is developing the "CO_2 Acceptor" coal gasification process.

- In 1985, Consolidation Coal plans to produce 75 million tons of coal.

9). GETTY OIL

- Is planning to produce 5.4 million tons of lignite a year in Texas.

APPENDIXES

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APPENDIX I: TABLE OF STEAM COAL PRICES AS OF 04/01/80

***** ***** ***** ***** ***** ***** ***** *****

CONSELHO NACIONAL DO PETRÓLEO = NATIONAL PETROLEUM COUNCIL

COMPANHIA AUXILIAR DE EMPRESAS ELÉTRICAS BRASILEIRAS = SUBSIDIARY COMPANY OF BRAZILIAN ELECTRICAL FIRMS

COMERCIALIZAÇÃO DO CARVÃO DE PRODUCÃO NACIONAL NÃO APLICÁVEL NA PRODUÇÃO

DE COQUE = MARKETING OF THE NATIONAL COAL PRODUCTION NOT APPLICABLE TO THE PRODUCTION OF COKE

Vigência a partir de = In effect as of
Estado produtor = Producing state
Empresa produtora = Producing company
Tipo de carvão (mina) = Type of coal (mine)

PC aproximado Kcal/kg = Approximate coal production Kcal/kg

Preco vigente de venda do produtor = Producer's current selling price

Preço de comercialização = Market price

Onus do CNP = CNP's share
Observacoes = Remarks
Bruto = Raw

Preco base de comercializacao = Base marketing price

Grupos A + B = A +B groups

Vapor secundario = Secondary steam

Grosso = Lump
Fino = Slack

Ato = Act

Portaria CNP No. PC-02/80, de 27/03/80, com vigencia a partir de 01/04/80 =

Government decree/$\overset{\text{CNP}}{\text{No.}}$ PC-02/80, of 3/27/80, in effect as of 4/1/80

Portaria CNP no. PC- 02/80, de 27/03/80. com vigencia a partir de 01/04/80 =

Government decree/$\overset{\text{CNP}}{\text{No.}}$ PC-02/80, of 3/27/80, in effect as of 4/1/80

Notas: (1) - O carvao Tech, etc.
(2) - Frete rodoviario, etc.
(3) - Sotelca: produzido, etc.
(4) - Frete; base seca, etc."

Notes: (1) - Tech coal has the coal production defined at 3,100 Kcal/kg ± 5%. thus being equal to the Candiota coal production: 3,200 Kcal/kg.

(2) - Highway freight of Cr$84.53/ton, between the Recreio mine and Charqueada, authorized by the CNP, as of 1/1/80.

(3) - Sotelca: produced in Capivari. Ash standard = 40%.

(4) - Freight; dry base, rounded off: CR$ 111.46 as of 4/1/80, in accordance with official letter CNP-SC-208/80, of 3/27/80. (proc. 505.156/79). For coal loaded on boats at Rio Fiorita, the freight is Cr $123.55.

Frete Mina-Capivari Freight Mine-Capivari
40% de cinzas = 40% ash

34% de cinzas = 34% ash

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APPENDIX II: COMPOSITION OF THE COST OF TRANSPORTATION OF STEAM COAL FROM SANTA CATARINA

***** ***** ***** ***** ***** ***** ***** ****

Composicao do custo do transporte de carvao de Santa Catarina = Composition of the cost of transportation of coal from Santa Catarina

maio/1980 = May 1980

Cr$/t = Cruzeiros$/ton

1) Carregamento vagões em Tubarão = Loading cars in Tubarão
   Transporte Tubarão-Imbituba = Transport Tubarão-Imbituba
   Despesas portuárias Imbituba = Harbor expenses

2) Frete marítimo = Maritime freight

3) Despesas portuárias = Harbor expenses

   Porto de Santos = Port of Santos

   Porto de Antonina = Port of Antonina

   Porto do Rio = Port of Rio

4) Docas - Depósito de CAEEB = Docks - CAEEB storage yards

Totais = Totals

Fonte: CAEEB = Source: CAEEB

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APPENDIX III; LIST OF ENTITIES INVOLVED IN COAL IN BRAZIL

***** ***** ***** ***** ***** ***** ***** ***** *****

Quadro 6A = Table 6A

Processo = Process

Produção de sólidos, líq. e gases = Production of solids, liquids and gases

Proprietário principal = Principal owner

Tempo de des. (anos) = Time since discovery (years)

Status = Status

Obsoleto = No longer in use

Pré- comercial = Pre-marketing

Comercial = Marketing

Pré- piloto = Pre-pilot

Demonstraçao = Demonstration

Piloto = Pilot

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Translated by
Wesley Kerney
CRS - Language Services
3/4/82 - amc

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COAL IN BRAZIL: SITUATION AND PROSPECTS

I - HISTORY

Long before the so-called "oil crisis" was unleashed, the Brazilian government was concerning itself with determining the volume of coal reserves in Brazil.

Initially through the National Coal Plan Commission [Comissão do Plano de Carvão Nacional] - CPCAN, which, beginning in 1964, stepped up the prospection works, carrying out research in diverse areas of the national territory, such as the states of Piauí and Pará, not to mention the producing areas of the three states in the Southern Region.

With the extinction of the CPCAN in January 1971, the attributions of that body passed to the National Department of Mineral Production [Departamento Nacional da Produção Mineral] - DNPM, in the part relative to guidance in geological research and coal mining, and to the National Petroleum Council [Conselho Nacional de Petróleo] - CNP, regarding production quotas, quality control of the coal and its marketing.

By the end of 1970 and all during the past decade, an intense prospecting program was carried out through the DNPM/CPRM agreement, and a large sum of resources was employed, especially in test boring.

The geological research aimed initially at the expansion of the known reserves of coking coal, by virtue of the growing demand by the National Siderurgical Plan. It aimed mainly at finding areas with better quality coal, having in view a greater participation of domestic coal mixed with imported coal to produce foundry coke and reduce the importation of metallurgical coal, which already weighed too heavily in the Brazilian balance of trade.

However, in the face of the worldwide energy crisis and the urgent need for the substitution of foreign energy sources by domestic sources, gas coal, seemingly static, received a new thrust, and the steam coal reserves, little used up until then, were broadly appraised, with a spectrum of applications being opened, in addition to thermoelectricity, in gasification, liquefaction, carbochemistry, cement industry, paper and cellulose factories, ceramics industry, and others of less demand.

The research work utilizing DNPM's ordinary resources was carried out from 1970 to 1979.

The main results of that ten year period of work [were] the discovery of large lignite resources in the Alto Solimoes region (Amazons), and the expansion of the "in situ" coal reserves of the Parana Basin, going from 2.71×10^9 tons in 1970 to 22.77×10^9 tons in 1979.

Also as a consequence of that work, coal with coking characteristics was discovered in 1976 in the Morungava region of Rio Grande do Sul, displaying for the first time coals with those characteristics outside of the carboniferous basin of Santa Catarina.

Beginning in 1980, the DNPM was fitted into the Energy Mobilization Program, participating not only as an analyzer of the various research and mining projects that are leading to [sic] the Ministry of Mines and Energy seeking financing, but also in the planning of a basic program of prospecting for coal, lignite and peat throughout the national territory.

II - FINANCIAL RESOURCES

By the end of 1979 the DNPM only had ordinary resources, which had been growing scarce as of 1975.

Although with insufficient resources, the research work unfurled with great objectivity, permitting an evolution of the known reserves (appendix I).

Those reserves, in relation to Brazil's needs, represent nearly 7,789 x 10^6 equivalent tons of oil, which permits considering coal as the most viable option for the substitution of petroleum derivates in the various sectors where these latter are called for.

With the creation of the Energy Mobilization Program through Decree-Law 1691 of 8/2/79, the various organizations responsible for the nation's energy policy were able to have specific resources in seeking solutions to alleviate the energy crisis that is ravaging the nation.

Within the PME the DNPM presented a Basic Project for the Prospecting of Coal, Lignite and Peat and of Technology Development for the period 1980-1985, which is currently in progress.

In 1980, the DNPM had Cr$ 615,000,000.00 and the CPRM Cr$ 1,215,000,000.00 for its own research, out of a total of Cr$ 11,235,873,000.00 pledged by the Ministry of Mines and Energy to take care of the various agreements signed with groups associated with the energy sector.

In 1981 the DNPM is counting on Cr$ 667,700,000.00 and the CPRM Cr$ 1,500,000,000.00, out of a total of Cr$ 16,200,000,000.00 which fell to the MME.

III - RESERVES AND RESOURCES

Notwithstanding the disproportion of the expenditures in 1980 and 1981 for the research sector, in relation to the amount made available for other purposes, it was possible for the DNPM to continue in its research work, demarcating and detailing areas for the opening of new mines, furnishing the technical subsidies for increasing the production of already-existing mines through mechanization, getting exploration works underway in the most varied points of the nation, trying to find evidence of new coal, lignite and peat beds.

The present situation of the reserves and resources of coal, lignite and peat in Brazil is as follows:

In Alto Solimões (Amazons) works carried out in 1975-1976 determined lignite resources along the lines of 36.9 x 10^9 tons for an area of 90, 062 km^2. Currently under study is the installation of small gasifiers in existing population groups in the region in the attempt to furnish electrical energy, today all based on diesel engines.

In the Paraná Basin the known reserves are 22.8 x 10^9 tons of coal "in situ".

On the Northeastern shoreline, extending from Bahia to Rio Grande do Norte we can already count on 83.7 x 10^6 m^3 of energy peat and 150.6 x 10^6 m^3 of farm peat.

Although lacking more detailed studies, there are estimated peat resources along the lines of 600 x 10^6 tons in Espírito Santo, 680 x 10^6 tons in the Paraiba do Sul River Valley, 40 x 10^6 tons in the state of Rio de Janeiro.

Other areas such as the region of the Madeira, Purus and Canuma rivers in the Amazons, regions of Belém and Santarém in Pará, Pantanal Mato-grossense and Ilha do Bananal in the midwestern region are potentially favorable to containing immense peat reserves. Those areas are in DNPM's schedule for 1982, aimed at prospecting for peat and lignite.

It is estimated that for all Brazil we will have peat reserves in the neighborhood of 25 billion tons.

IV - COAL PRODUCTION

The initially established goals of 27.5 x 10^6 tons of useable coal by the year 1985 were considered unviable.

The present energy model foresees a production of 17.0 x 10^6 tons of coal in 1985, a goal which is possible to attain as the table on mine production (Appendix II) shows.

The production of useable coal in the last three years was:

1978.......... 4,438,793 tons

1979.......... 4,813,580 tons

1980.......... 5,241,586 tons

In order to reach that production in 1985, or in other words multiply the 1980 production by 3.2, it means that the new mines scheduled to go into operation in the years 1982-1983-1984, will have to do it. Otherwise, logically, the goal will not be reached. Therein lies the need for financial resources.

The new mines that will have to receive resources from the PME were those that combined technical conditions and were situated close to highway and railway branches, which would permit the hauling away of the production.

V - FINAL CONSIDERATIONS

It is seen by the production data of the last three years that the increase did not exceed the rate of 10% a year.

The production scheduled for 1985, along the lines of 17 million tons can be reached, since resources have been freed for the opening of the new mines. These will have to go into production as of 1982 and thus they will contribute towards reaching the desired goal.

However, it is important to emphasize that this increase from 5.2×10^6 tons to 17.0×10^6 tons, while less than that previously scheduled, must be faced in the same way with a great deal of care and attention, with regard to the impact it will cause on the environment.

The National Coal Plan, although without the impetus put down on paper, is being developed, in practice, normally, by freeing up financial resources for those traditional miners who have shown capability for going ahead with the undertaking. This making haste slowly is, in our opinion, beneficial, for it will permit foreseeing mistakes and going around them, making the race to coal really a solution to the energy problem and not just an increase of worries for our nation.

Brasilia, August 26, 1981

Benedicto Waldir Ramos

Geologist
DNPM/DGM

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PARANA BASIN

EVOLUTION OF THE "IN SITU" COAL RESERVES

Estados = States

Reservas x 10^6 t =Reserves x 10^6 tons

Fonte: DNPM-CPRM-COPELMI-CRM = Source: DNPM-CPRM-COPELMI-CRM

(Revisto e atualizado em 17/08/81) = (Revised and updated on 8/17/81)

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Translated by Wesley Kerney
CRS - Language Services
3/4/82 - amc

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COAL ENERGY PROSPECTS

Talk presented by the President of the CAEEB, Dr. Ney Webster Araujo

Engineering Club - Rio de Janeiro
October, 1980

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I - INTRODUCTION

The Brazilian Energy Model has divulged the guidelines and quantitative goals that represent the Nation's response to the worldwide liquid fuel crisis.

That document determines that domestic gas coal will be the energy input charged with replacing fuel oil, basically in the southern and southeastern regions of Brazil.

It is highly important for us to be aware of that fact because if coal does not succeed, for any reason, in playing the role which has been reserved for it, all our government's effort at solving the energy problem will be frustrated, even considering the full success of Proalcool, for example. This because, given the relative inflexibility of the refining plan, the substitution of a given by-product (alcohol for gasoline), by itself, will not solve the domestic energy problem, because the other derivates will obviously require the same oil imports.

As for coal, it is worth mentioning that its relative marginalization in the framework of domestic energy fuels is now requiring considerable efforts by the whole nation. Besides, in terms of per capita/year consumption, coal is at the level of 75 kg in Brazil, whereas in the United States that level is 2,500 kg., or in other words, 33 times more. In 1979, gas coal represented only 4.3% of the consumption of prime energy.

Because of the initially emphasized figures, that profile of consumption must of necessity change, it will change, and we are all going to work together to change it.

We recall that the goals established for domestic coal determine an additional production of 22.5 million tons by 1985, destined to take the place of fuel oil.

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TABLE I

BRAZILIAN GAS COAL RESERVES

Estado = State

Reservas 10^6 toneladas = Reserves 10^6 tons

Medidas = Measured

Indicadas = Indicated

Inferidas = Estimated

Total = Total

Fonte: DNPM, Dezembro, 1979 =Source: DNPM, December, 1979

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Producao de carvao no Rio Grande do Sul por tipo = Coal production in Rio Grande do Sul by type

1 semestre 1980 = 1st half-year 1980

tipo = type

Copelmi = Copelmi

Total = Total

Estimativa de produção de carvão no Rio Grande do Sul por tipo = Estimate of coal production in Rio Grande do Sul by type

10^3 t = 10^3 tons

tipo de carvao = type of coal

cz = ash

Total = total

Fonte:CRM, COPELMI e CPRM - Setembro /80 = Source: CRM, Copelmi and CPRM, September/1980

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Producao de carvao de Santa Catarina - por tipo = Coal production in Santa Catarina by type

1° semestre 1980 = 1st half-year 1980

tipo de carvão = type of coal

produção (10^3 t) = production (10^3 tons)

cz =ash content

Total = Total

Estimativa de produção de carvão em Santa Catarina por tipo 1981-1985

Estimate of coal production in Santa Catarina by type 1981-1985

tipo de carvão = type of coal

cz =ash content

10^3 t = 10^3 tons

Total =Total

Fonte: Companhias de mineração - Setembro /80 = Source: Mining companies - September 198

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Produção de carvão do Paraná por tipo = Coal production in Paraná by type

1° semestre - 1980 = 1st half-year 1980

Tipo de = Type of

Produção (10^3 t) = Production (10^3 tons)

cz = ash content

Estimativa preliminar de produção de carvão no Paraná - por tipo = Preliminary estimate of coal production in Paraná - by type

Ano = Year

Produção (10^3 t) = Production (10^3 tons)

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3.5 Projects already submitted to CAEEB

Rio Grande do Sul

CRM - Iruí Mine
Leão II mine
Candiota Mine (expansion)
COPELMI - Recreio Mine (expansion)
Triunfo Mine
Anticipated Production - 11.2 x 10^6t (ROM) /ano.
Anticipated investments - US 300 x 10^6

Santa Catarina

C.B.C. Araranguá - Mine 3
C.C. Criciúma - Mine 2
C.C. Urussanga - Rio América Mine
- Rio Caetê Mine

Anticipated production - 2.4 x 10^6 tons (CPL)/year
Anticipated investments - US$ 66.0 x 10^6

3.6 Projects in the drawing board stage

Rio Grande do Sul - 10 projects for new mines with an installed capacity of 18.5 x 10^6 tons (ROM)/year.

Santa Catarina - 14 projects for new mines and 7 projects for expanding the capacity of mines already in operation.
Total installed capacity of 6.7 x 10^6 tons (CPL)/year

Parana - 1 project for a new mine and expansion of the present mine, with a capacity of 1.6 x 10^6 tons (ROM)/ year

3.7 Total domestic production

The consolidation of the anticipated domestic production is along the lines of 60 x 10^6 tons (ROM)/year.

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TABLE VIII BENEFICIATION CAPACITY (PRESENT AND PLANNED)

Estados = States

Atual = Present

Capacidades = Capacities

em 10^6 t de R.O.M. = in 10^6 tons of R.O.M.

em 1985 (prevista) =in 1985 (anticipated)

déficit =deficit

Total = Total

Abrangendo a pré-lavagem, etc. = Including the pre-wash and final beneficiation in the Capivari washer, S/A or another beneficiation center unit.

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TRANSPORTATION OF COAL IN BRAZIL

The transport of coal in Brazil is entrusted to the Ministry of Transportation which, basing itself on the reports on energy coal production and demand, is carrying out studies for the expansion of the necessary services for the transportation of domestic coal to take the place of imported fuel oil. These studies will define the programs to be put into practice and the investments needed for this purpose.

RAILWAYS

The railway transportation of steam coal, due to the previously described demand, will show a large increase. In addition to the traditional transportation of coal, in Santa Catarina, the railway will have to be responsible in forthcoming years for substantial volumes along the Rio Grande do Sul mines and, immediately, for the growing outflow of coal in the Southern Trunk, destined for the cement factories of Paraná and São Paulo. These facts require expressive transformations in the railway network, involving the following aspects:

- expansion of the fleet of cars and locomotives;
- modernization of the Southern Main Trunk;
- modernization and electrification of the Operational Division of Tubarão;
- construction of railway access branches to the mines.

Some activities in this area have already been being carried out with resources of the 1980 budget, at the same time that the 1981 programming is being defined.

Inland Navigation and Cabotage

Up until now the transporting of coal by cabotage has been practically limited to the coal from Santa Catarina. As of the third quarter of last year, steam coal was added to the traditional transportation of metallurgical coal. This latter type of transport has been experiencing an expressive growth.

The steam coal moved along the shore is marginal in relation to the total amount of coal transported. Its transport has to be satisfactorily achieved.

At the present time there exists a fleet of 11 grain ships authorized to operate in the transporting of ore, in cabotage, amounting to a total of 211 thousand tons of dead-weight tonnage, inasmuch as the great majority is turned to the exclusive movement of coal. By 1982, another 5 grain ships, already contracted for, will be incorporated into this fleet, for a total of over 75,000 dead-weight tons, in the course of the 2nd Naval Construction Program.

Thus, the maritime transportation capacity appears to be sufficient for handling the outflow of steam and metallurgical coal, previously anticipated, up to and including 1983. In 1984 and 1985, it is estimated that there will be a strong inflection on the coal demand curve, and it will be necessary to add 220 thousand more dead-weight tons to the fleet that is operating at that time.

The Ministry of Transportation, through the SUNAMAM, is completing the studies for sizing the grain fleet for coal, aimed at contracting for the construction of new ships in the Nation's naval industry.

In the case of inland navigation, growing streams of transportation will have to take place from the Lower Jacui Mines in the direction of Porto Alegre, Pelotas, Rio Grande and other small ports. The outflows transported by inland navigation will have to increase from 1.1 million tons in 1981 to 5.2 million tons in 1985.

The Ministry of Transportation has initiated meetings with the shipbuilders in order to ensure the expansion of the transportation capacity to 500 thousand dead-weight tons in 1985.

Ports

The movement of the coal outside the producing states, should be done in the following way:

- Santa Catarina - almost completely through cabotage, using the port of Imbituba for its transfer.

- Rio Grande do Sul - predominantly through cabotage with the use of inland navigation in feeding the port, carrying the coal from the Lower Jacuí mines mainly to the harbors of Porto Alegre, Pelotas and Rio Grande. The Southern Trunk railway will be used as a complement.

The coal hauled by cabotage will be received at the ports of Antonina, Santos, Cosipa, Sepetiba, Rio de Janeiro, Vitória and Praia Mole. Use of gas coal in the Nordeste is not envisioned. By reason of this fact, there are likewise no measures for making the ports of the region suitable.

The shipping ports are: Imbituba - Santa Catarina, Porto Alegre, Pelotas, Rio Grande and Rio Grande do Sul and the receiving ports are: Antonina - PR, Santos - SP, Rio de Janeiro and Sepetiba - RJ.

The measures by the Transportation Sector, in essence, aim at ensuring, at the proper time, the necessary infrastructure of transportation for the transfer of the coal as well as preventing the formation of bottlenecks that impede the full realization of the program underway by the other sectors that are engaged in the process of exploration and marketing of domestic coal.

ENERGY COAL DISTRIBUTION CENTERS

Introduction

To meet the demand for coal at the diverse industrial sectors, the CAEEB has implemented an infrastructure of marketing and distribution of this input, which is now in full operation.

As a function of the signing of the Cement Protocol, of the growth of the market and of other emerging sectors, the CAEEB is developing a program of implementation and interiorization of distribution centers, aimed at a suitable system of supply of energy coal to the consumer regions.

The program of implementation of distribution centers now underway has the participation of representatives from various departments of the Ministry of Transportation (CEIPOT, RFFSA, AGEF, PORTOBRAS), the National Petroleum Council and the governments of the coal-producing states.

Distribution Centers in Operation

At the present time, the following are the distribution centers in operation by the CAEEB:

Rio Grande do Sul

Distribution center of Charqueadas

Situated at the mouth of the Charqueadas mine, it possesses a stockpiling capacity along the lines of 100,000 tons/month and its coal is for the most part

35% ash content, and is beneficiated by the washer of the Piratini Refined Steels S/A. It also receives coal from the Recreio mine.

It supplies the Rio Grande do Sul cement sector and other small industries.

It also acts as a distribution center for depots located in other states.

SANTA CATARINA

Tubarão Distribution Center

Situated near the washer of Capivari S/A, with an operating capacity of up to 4 million tons. It receives an average monthly feeding of 50,000 tons of steam coal, coming from the benefication of pre-washed coal.

It supplies the state's existing cement factory, which in the future will be taken care of by the Itajaí distribution center.

Other industries are supplied at this depot.

It is the distributor of Santa Catarina coal to depots in other states.

PARANÁ

Distribution center of Antonina

Located at the Antonina harbor, it possesses a stockpiling capacity along the lines of 35,000 tons/month.

It supplies as priority three cement industries in the state, with Santa Catarina coal having a 35% ash content and other industries with coal having a 40% ash content.

Distribution center of Rio Grande

Located in an area to be ceded by Portobrás, in Rio Grande harbor, with a stockpiling capacity along the lines of 100,000 tons a month, with coals of 35% and 40% ash content.

It will have as its purpose the supplying of local industries and serving as a distribution center for depots in other states.

Distribution center of Porto Alegre

Located in a harbor area of the capital city of Rio Grande do Sul, with a stockpiling capacity of approximately 150,000 tons a month.

Its main purpose will be to act as a distribution point, via the Southern trunk.

Santa Catarina

Distribution center of Itajai

Located in an as yet undetermined area, it will have a stockpiling capacity along the lines of 75,000 tons a month.

By priority, it will serve the cement industries and other industrial sectors which represent, in the short term, a consumption now identified as 50,000 tons a month.

This distribution center will be supplied by the Tubarao distribution center.

Paraná

Distribution center of Balsa Nova

The land has already been selected and negotiations are now underway with a view to its purchase or rental.

Its area is approximately 30,000 square meters

The anticipated stockpiling capacity is 70,000 tons a month and it will have as its main purpose supplying the Paraná cement industries with coal coming from the Jacui basin, Rio Grande do Sul, through the Southern Trunk.

SÃO PAULO

Distribution center of Sorocaba

The land selected belongs to the Ministry of Agriculture (IPANEMA farm) and is located near FEPASA's George Oeterer railroad station. The area to be obtained will be in the neighborhood of 100,000 square meters.

The anticipated stockpiling capacity is 130,000 tons a month and it will mainly supply the São Paulo cement industries with coal from Rio Grande do Sul, transferred via the Southern Trunk.

RIO DE JANEIRO

Distribution center of Sepetiba

Negotiations are going on with Portobrás for obtaining the area necessary for the implementation of this depot in the harbor of Sepetiba.

The anticipated initial stockpiling capacity is 100,000 tons a month and it will supply the cement industries of the states of Rio de Janeiro and Minas Gerais. In the future it will also supply the State Gas Company - CEG, in Itaguai, Rio de Janeiro.

MINAS GERAIS

Distribution center of Matozinhos

The land has already been selected and negotiations are underway for the purchase or leasing of the chosen area, which has nearly 150,000 square meters.

The anticipated stockpiling capacity is 140,000 tons a month and it will supply the cement factories located in Minas Gerais with coal from Rio Grande do Sul and Santa Catarina.

Initially, the supplying of this depot will be accomplished through the port of Rio de Janeiro, provided it is not possible through the port of Vitória.

The obstacle to this latter alternative is the Santa Barbara/Costa Lacerda stretch, due to its high density of traffic.

ESPÍRITO SANTO

Distribution center of Vitória

The harbor at Paul was considered favorable for the installation of this depot, although it does not have the conditions for an immediate implementation. However, the area adjacent to the present USIMANAS harbor terminal can be reserved for a first-stage installation. Later on the coal-handling and unloading equipment of the present terminal can be relied on for use, at the time of USIMINAS' move to Praia Mole.

The area to be occupied is approximately 40,000 square meters. With an anticipated stockpiling capacity of 150,000 tons a month, it will supply Itabira Agro-Industrial Cement and will function in the future as a branch of the Matozinho distribution center.

The total cost of investments for the implementation of the distribution centers is shown in an attached table.

The distribution centers of Butiá, Rio Grande and Porto Alegre, all in Rio Grande do Sul, and Itajaí (Santa Catarina), did not have their costs included in the attached table, by virtue of the investments being of a lesser amount and being paid for by specific projects for presentation to the National Petroleum Council - CNP.

***** ***** ***** ***** ***** ***** ***** *****

CRS - 34

Custo total de investimento (preços, julho/80) =

Total investment cost (prices, july/80)

entreposto = distribution center

item orçamentário = budget item

projeto = project

levantamento planialtimétrico, terraplenagem e drenagens =

land surveying, landscaping and drainage

obras civis = civic works

sistemas de manuseio e estocagem = handling and stockpiling systems

subtotal = subtotal

aquisição de equipamentos = purchase of equipment

balancas = scales

trator c/lâmina e pá carregadeira = tractor with bulldozer blade and bucket

equipamentos específicos = specific equipment

sistema de iluminação = lighting system

montagem e instalação = setting-up and installation

obras civis = civic works

terraplenagem = landscaping

edifiçacões e fundações de balancas = scale buildings and foundations

trilhos assentados = rails laid

administração = administration

engenharia = engineering

compras = purchases
fiscalização = supervision
inspeção - inspection
total =total
total por item = total per item

***** ***** ***** ***** ***** ***** ***** *****

CRS - 35

[map on pp. 19]

legenda = legend

estradas de ferro = railways

fábricas de cimento = cement factories

entrepostos = distribution centers

céu aberto = strip mines

sub-solo = underground

[cannot decipher last two]

CAEEB - Companhia [illegible] de Empresas Elétricas Brasileiras =

CAEEB - [illegible] Company of Brazilian Electrical Enterprises

diretoria tecnica = technical department

localização das fabricas de cimento e sistema de transporte =

location of cement factories and transportation system

***** ***** ***** ***** ***** ***** ***** *****

[graph on pp 20]

evolucao da relacao "producao/consumo" de carvao vapor

evolution of the "production/consumption" relationship of steam coal

periodo: 1976 ate 1979 - period: 1976 to 1979

consumo = consumption

***** ***** ***** ***** ***** ***** **** *****

[graphs on pp. 21]

desenvolvimento da estrutura de consumo do carvão vapor =

development of the steam coal consumption structure

período: 1976 até 1° semestre de 1980 = period: 1976 to 1st half of 1980

novos consumidores = new consumers

consumidores tradicionais = traditional consumers

cimento - cement

papel e celulose = paper and cellulose

cerâmica = ceramics

outros = others

termeletricidade = thermoelectricity

transporte [illegible] = [illegible] transportation

siderurgia de reducao direta = direct-reduction steel and iron making

***** ***** ***** ***** ***** ***** ***** *****

[tables on pp 22]

estruturas de consumo de carvão energetico de 1976 a 1980 =

energy-coal consumption structures from 1976 to 1980

setor de consumo = consuming sector

tradicional = traditional

termeletricidade = thermoelectricity

transportes = transportation

sid. redução direta = direct-reduction steel & iron making

emergente = emerging

cimento = cement

outros = others

total = total

* os valores desta tabela são aproximados, etc. = The values in this table are approximate, based on documents of intent and indicating solely "lines of quantity".

previsão de consumo de carvão energético por setor 1981/1985 =

use of energy-coal envisioned for 1981/85 by sector

setor de consumo = user sector
termeletricidade = thermoelectricity
transporte = transportation
siderurgia = iron and steel manufacture
cimento = cement
combustão = fuel
papel e celulose = paper and cellulose
petroquímica = petrochemistry
gaseificacão = gasification
total = total

***** ***** ***** ***** ***** ***** ***** *****

[chart on pp 23]
carvão energético comprado - 1980 = energy- coal purchased - 1980
toneladas = tons
tipo = type
jan a junho = January to June
julho =July
agosto = August
setembro = September
outubro = October
novembro = November
dezembro = December
cz = ash content
total = total

***** ***** ***** ***** ***** ***** ***** ***** *****

[chart on pp 24]
carvão energético vendido - 1980 = energy-coal sold- 1980
segmento industrial = industrial sector
tipo cz = type [according to] ash content
jan a junho = Jan. to June
julho = July
agosto = August
setembro = September

outubro = October
novembro = November
dezembro = December
cz = ash content
total = total

***** ***** ***** ***** ***** ***** ***** *****

[chart on pp 24]
carvão energético vendito - 1980 = energy-coal sold - 1980
segmento industrial = industrial sector
tipo cz = type [according to] ash content
jan a junho = Jan. to June
julho = July
agosto = August
setembro = September
outubro = October
novembro = November
dezembro = December
energia ele = electrical energy
cimento = cement
outros = others

***** ***** ***** ***** ***** ***** ***** *****

[chart on pp 25]
estoque de carvão energético - 1980 = stockpile of energy-coal - 1980
toneladas = tons
tipo = type
cz = ash content
jan a junho = Jan to June
julho = July
agosto = August
setembro = September
total = total

***** ***** ***** ***** ***** ***** ***** *****

[chart on pp 26]

conselho nacional do petróleo = national petroleum council

companhia auxiliar de empresas elétricas brasileiras = subsidiary company of Brazilian electrical firms

comercialização do carvão de produção nacional nao aplicável na produção de coque = marketing of the national coal production not applicable to the production of coke

vigência a partir de = in effect as of

estado produtor = producing state

empresa produtora = producing company

tipo de carvão (mina) = type of coal (mine)

pc aproximado (Kcal/kg) = approximate coal production (Kcal/kg)

preço vigente de venda do produtor = producer's current selling price

preço de comercializaçao = market price

onus do CNP = CNP's share

observacoes = remarks

bruto = raw

ato = act

preço base de comericalizaçao = base marketing price

fob mina Leao = FOB Leao mine

FOB Charqueadas = FOB Charqueadas

grupos A + B = A + B groups

vapor secundario = secondary steam

frete mina - Capivari = freight mine to Vapari

40% de cinzas = 40% ash content

FOB Tubarão = FOB Tubarão

34% de cinzas = 34% ash content

bruto = raw

grosso = lump

fino = slack

Portaria CNP no. PC-06/80, etc. = Government decree no. PC-06/80, of 7/9/80, in effect as of 7/1/80.

Portaria CNP no. PC-07/80, etc. = Government decree no. PC-07/80, of 7/9/80, in effect as of 7/1/80.

Institutional Aspects

As regards the institutional aspects, we must observe them through 3 (three) correlated focal points, namely:

1) Area of competence of different Ministries.

2) Responsibilities divided among departments of the M.M.E.

3) Normative instruments.

The first proposes to attribute to the M.M.E. the task of coordinating the actions relative to research, production, transformation and marketing of coal. The responsibility for providing the necessary means for moving the coal, from the producing sources to the distribution centers falls to the Ministry of Transportation, with the Ministry of Industry and Trade being responsible for supporting the industries with regard to the technological transformations necessary for consumption.

The second focal point is outlined in Figure 10.

Lastly, the third focal point is founded basically in two legal instruments, to wit:

CNP/CAEEB Agreement

Entered into on 11/19/1975, whereby the CAEEB was brought into the secenario of the economic cycle of coal, as the executor of the policy of subsidies for the prices of this fuel (considered, at the time, as the most suitable strategy for motivating industrial use);

Government Decree MME No. 2520:

issued on 12/20/1979, conferring on the CAEEB, among other departments of the cabinet area, attributions in addition to those it already had with regard to the above-mentioned Agreement, with a view to the program for replacing petroleum derivates with domestic gas coal.

Financial Resources

Four resource sources will have to provide the means needed for achieving the objectives explained herein, as is shown in Figure 2.

It is worth observing that for the purpose of materializing the source considered in Item 4 of the above-mentioned Figure, it is indispensable that the selling price of the coal cover the cost of all the production factors, including therefore a emuneration compatible with the capital, actually applied.

By way of illustration, we are showing the prices that are in effect at the present time, revisable semi-yearly in January and July of the subsequent years.

It is worth recalling that the future trend will be the seeking of the real price, i.e., the subsidy must gradually be eliminated. However, pursuant to the standard now in effect the withdrawal of the subsidy will come about always after the same measure is seen in the price of fuel oil, thus holding the relationship of the prices in a way so the price of coal does not exceed the level of 70% of the price of fuel oil.

Conclusion

In light of what has been explained, concluding words remain to be said for the purpose of better transmitting the philosophy of the government's action.

Everything is based on a tripod, perfectly intelligible, to wit:

1) Energy autonomy.

2) Technological autonomy.

3) Support for private enterprise.

In order to achieve the consolidation of this tripod it is fundamental that a perfect interaction between the agents, public and private, takes place. Therefore, if the government proposes to furnish, through logistics proper, physical and financial [assistance',in addition to prices administered above-board, it is logical to expect the total enlistment of the national private sector. In short, it is a matter of a concerted action between the government and firms of the private sector.

***** ***** ***** ***** ***** ***** ***** *****

[Fig. 2 on pp 29]

RESOURCES

1. Program of Energy Mobilization

   Decree-Law No. 1691, of 8/2/1979

   Decree-Law No. 1785, of 5/13/1980

2. Resources of financing from official banks

   BNDE

   BB

3. Resources of outside financing

   P.E. Poland, France

   Regional organization

4. Resources of the executors of the projects.

***** ***** ***** ***** ***** ***** ***** *****

Translated by Wesley Kerney - CRS - Language Services - 3/8/82 - amc

PETROBRAS
PETRÓLEO BRASILEIRO S.A

A PROBLEMÁTICA DO CARVÃO MINERAL NO BRASIL

ROBERTO GARCIA

Rio, 28 de Maio de 1980

RESERVAS

O carvão mineral ocorre em vários pontos do território brasileiro como se pode ver pela Figura 1. Quanto ao tipo, temos desde o linhito até o antracito. O linhito é um carvão geologicamente novo, altamente reativo, normalmente com alto teor de umidade, e que não se presta ao uso na siderurgia convencional. As reservas brasileiras de linhito localizadas em Atalaia do Norte e Letícia, no Alto Amazonas, foram descobertos pela Shell e ainda não se encontram cubadas. As ocorrências no Pará, Goiás e Piauí não são comercialmente exploráveis. Realmente as reservas significativas, até agora conhecidas no Brasil, são as localizadas nos estados do Paraná, Santa Catarina e Rio Grande do Sul, onde os carvões são do tipo betuminoso e sub-betuminoso.

As reservas de Rio do Peixe, Paraná, são no entanto, muito pequenas: apenas 40 milhões de toneladas. Trata-se de lavra subterrânea e parte da reserva contém alto teor de urânio nas cinzas, estando a Nuclebrás estudando presentemente uma maneira de extrair este urânio.

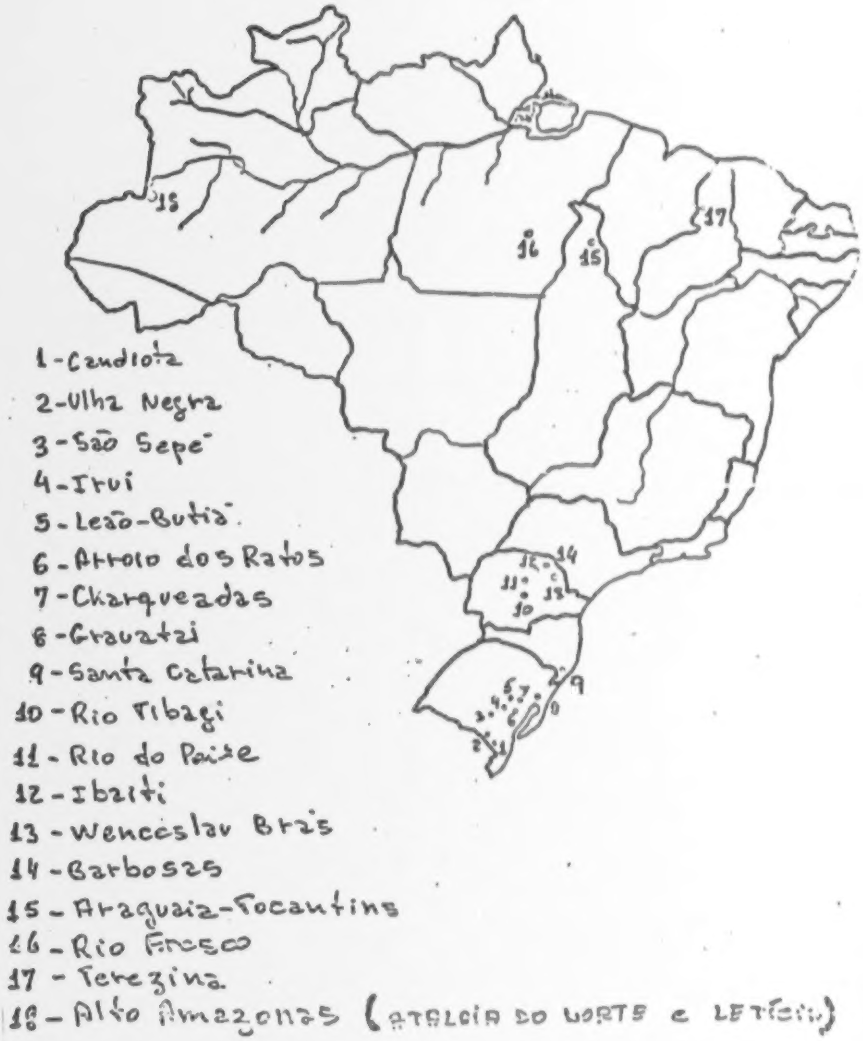
Em Santa Catarina, a bacia carbonífera mostra 3 camadas sobrepostas de carvão:

- camada Barro Branco
- camada Irapuá
- camada Bonito

A camada Irapuá, normalmente intermediária às outras duas, tem uma reserva muito pequena.

De um modo geral a lavra das camadas Barro Branco e Bonito tem de ser subterrânea, ocorrendo no entanto, pequenas porções em que é possível se fazer a lavra a céu aberto. A camada superior é a Barro Branco, assim chamada devido à presença junto ao carvão de uma camada de argila branca, e é a única portadora de carvão metalúrgico coqueificável. Sua reserva total é de 847 milhões de toneladas e é, atualmente, a única camada em mineração.

FIG. 1 - OCORRÊNCIAS DE CARVÃO MINERAL NO BRASIL



1 - Candiota
2 - Ilha Negra
3 - São Sepé
4 - Irui
5 - Leão-Butiá
6 - Arroio dos Ratos
7 - Charqueadas
8 - Gravatai
9 - Santa Catarina
10 - Rio Tibagi
11 - Rio do Peixe
12 - Ibaiti
13 - Wenceslau Brás
14 - Barbosas
15 - Araguaia-Tocantins
16 - Rio Fresco
17 - Terezina
18 - Alto Amazonas (ATALAIA DO NORTE e LETÍCIA)

ESTADO	JAZIDAS			RESERVAS (10^6 t)				TOTAL DA JAZIDA (10^6 t)
				Medida	Indicada	Inferida	Totais	
RIO GRANDE DO SUL	CANDIOTA	Céu aberto		302,00	250,00	-	552,50	8.000,00
		Mina subterrânea		50,00	661,50	6.736,00	7.447,50	
	IRUÍ	Céu aberto		16,00	-	-	16,00	1.829,70
		Mina subterrânea		96,80	216,90	1.500,00	1.813,70	
	LEÃO - BUTIÁ	Mina subterrânea		160,00	-	1.500,00	1.660,00	1.660,00
	CHARQUEADAS	Mina subterrânea	Camada I 1F	325,70	188,10	63,00	576,80	1.560,70
			Camada I 2B	340,20	143,70	500,00	985,90	
	GRAVATAÍ	Subterrânea		-	-	(?) 1.000,00	-	1.000,00
SUB-TOTAL	-			1.291,20	1.460,20	11.299,00	-	14.050,40
SANTA CATARINA	SANTA CATARINA	Camada Barro Branco	Céu aberto	30,00	-	-	30,00	1.705,26
			Mina subterrânea	209,17	387,03	221,16	817,36	
		Camada Irapuá	Céu aberto / Mina subterrânea	-	-	10,00	10,00	
		Camada Bonito	Céu aberto	15,00	-	-	15,00	
			Mina subterrânea	15,90	206,50	610,50	832,90	
SUB-TOTAL	-			270,07	593,53	841,66	-	
PARANÁ	RIO PEIXE	Mina subterrânea		28,40	11,60	-	40,00	40,00
TOTAIS	-			1.589,67	2.065,33	12.140,66	-	15.795,66

TABELA 1 - RESERVAS DE CARVÃO NO BRASIL

A camada Bonito apresenta uma reserva apreciável - 848 milhões de toneladas - mas, como tem um rendimento de carvão metalúrgico muito baixo (20%) os mineradores não se têm interessado nem mesmo em adquirir conhecimentos melhores sobre ela. Assim, em 1976, durante o início dos estudos de carvão pela PETROBRÁS, surgindo a necessidade de se ter melhores dados sobre a camada Bonito, a PETROBRÁS teve de pagar os custos de 11 furos de sonda na região de Içara. Outros trabalhos de sondagem (Projeto Carvão Bonito Gaseificável) foram realizados em 1977 pela CPRM através do DNPM em convênio com a PETROBRÁS com o mesmo objetivo, quando então se realizaram 127 furos.

No Rio Grande do Sul está a maior parte de nossas reservas de carvão, num total de 14.050 milhões de toneladas das quais cerca de 568 milhões são passíveis de mineração a céu aberto. Entretanto, em nenhuma das jazidas conhecidas até agora do RGS há carvão coqueificável. Em termos de reservas energéticas, a reserva total brasileira, estimada em 15.796 milhões de toneladas, equivaleria a $4,95 \times 10^{10}$ barris de petróleo, aproximadamente o consumo de petróleo no Brasil por 130 anos nos níveis atuais.

Um dos grandes problemas do carvão brasileiro é seu teor de cinzas extremamente elevadas - veja Tabela 2 - o que quase sempre obriga ao beneficiamento, de modo a reduzir o teor de cinzas, antes da aplicação industrial. Na Figura 2 se pode visualizar o problema.

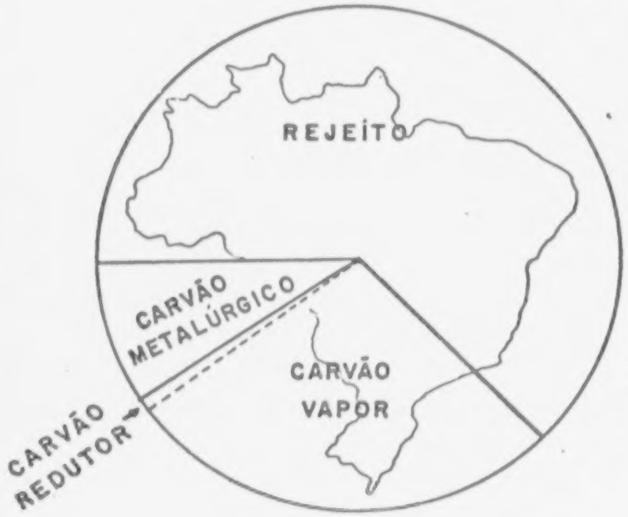
TABELA 2 - PRINCIPAIS CARACTERÍSTICAS DOS CARVÕES BRUTOS BRASILEIROS

CARVÃO	CINZAS* %	ENXÔFRE* %	UMIDADE %	PODER * CALORÍFICO KCAL/KG
Pré-Lavado de Sta. Catarina	31,7	2,0	2,4	5 635
Candiota - RS	51,4	1,3	15,0	3 300
Charqueadas - I_1F-RS	56,6	1,6	8,0	2 930
Charqueadas - I_2B-RS	45,0	1,2	8,8	3 990
Leão - RS	52,0	1,5	9,6	3 200

* em base sêca

(48)

DECOMPOSIÇÃO DO CARVÃO MINERAL BRUTO(ROM)



1978

LEGENDA:		UNIDADE : Tonelada
REJEITO	: 62,8%	7.420.408
CARVÃO VAPOR	: 27,3%	3.222.820 (-Redutor)
CARVÃO METALÚRGICO	: 9,6%	1.130.089
CARVÃO REDUTOR	: 0,3%	42.942
		11.816.259 (Total ROM)

FIGURA 2

MINERADORES E PRODUÇÃO

Em Santa Catarina há 10 companhias de mineração de carvão, sendo 1 estatal e 9 particulares. Como se pode ver pela Tabela 3 a grande maioria delas produz pequenas quantidades de carvão e, naturalmente, não têm estrutura funcional e financeira para se lançar a grandes produções a médio prazo.

Atualmente todas as minas utilizam o método de câmaras e pilares para a mineração subterrânea, sendo que apenas duas companhias (Próspera e Metropolitana) têm sistemas mecanizados de produção. Este método permite a recuperação de, no máximo, 50% da jazida uma vez que é imperativo se deixar pilares, contendo carvão, sem mineração para a sustentação do teto. O método alternativo, o "long-wall", permite um aproveitamento de 70% ou mais do carvão da jazida, além de dar uma maior produtividade. Entretanto, com excessão de um pequeno "long-wall" semi-mecanizado que funcionou na Mineração Próspera (estatal), a grande maioria dos mineradores de carvão no Brasil têm hesitado já por longos anos em adotar este processo de mineração por várias razões: falta de capacidade financeira, falta de suporte técnico, etc.

No Rio Grande do Sul há apenas duas companhias mineradoras de carvão: a Copelmi (particular) e a Cia Riograndense de Mineração (estatal). A CRM tem duas minas: a mina a céu aberto de Candiota, que fornece carvão unicamente para a usina termoelétrica de Candiota, e a mina subterrânea do Leão I, que fornece carvão para a fabricação de cimento e para termoeletricidade. Atualmente está sendo aberta uma nova mina da CRM-Leão II - cuja produção se destinará à Usina de Gaseificação de São Jerônimo e à fabricação de cimento. Nesta nova mina será adotado, pela primeira vez, o processo de mineração "long-wall" mecanizado.

A COPELMI atualmente minera a camada I_1F da reserva de Charqueadas. Nesta mina o carvão ROM é lavado e a fração mais nobre (teor de cinzas de 32,5%) é usada como redutor no forno de redução direta

TABELA 3 - MINERADORES DE CARVÃO DE SANTA CATARINA E RIO GRANDE DO SUL E SUAS PREVISÕES DE PRODUÇÃO.

COMPANHIA MINERADORA	ESTADO	PREVISÃO DE PRODUÇÃO ÚTIL 1000 t			
		1979	1980	1982	1984
PRÓSPERA (CRICIÚMA, SIDERÓPOLIS)	SC	700	830	1250	1290
METROPOLITANA	SC	705	800	1300	1300
SÃO ROQUE	SC	600	753	1122	1320
URUSSANGA	SC	370	500	840	1200
ARARANGUÁ	SC	264	480	950	900
TREVISO	SC	142	160	160	660
CATARINENSE	SC	149	216	240	480
BARRO BRANCO	SC	127	220	770	800
PALERMO	SC	41	60	120	360
BARÃO DO RIO BRANCO	SC	52	50	50	90
CRM (CANDIOTA E LEÃO)	RS	832	1300	1300	4.280 (2)
COPELMI	RS	782	900	1800	1800
TOTAIS		4.764	6269	9902	14480

FONTE: CAEEB

NOTAS: 1 - Produção de 1979 foi a real segundo o CNP
2 - 3980 mil t. de carvão em Candiota, 300 mil t. em Leão I.
3 - A nova mina (Leão II) da CRM deverá entrar em produção normal em 1985 com 1 milhão de t/a de carvão útil.

da Aços Finos Piratini. A fração mais pobre, com teor de cinzas de 55%, serve como combustível termoelétrico para a Usina Termoelétrica de Charqueadas. A COPELMI planeja abrir uma nova mina para atender à demanda das caldeiras a carvão do COPESUL e também à indústria cimenteira.

No Paraná existe apenas uma mina-Cambuí- cuja produção é utilizada nas caldeiras da fábrica de celulose da Klabin e na usina termelétrica de Figueiras. Como a reserva é muito pequena, não se justifica a abertura de novas minas.

A produção de carvão no Brasil tem se apresentado ligeiramente crescente conforme se pode ver pela Tabela 4. Nesta tabela se pode ainda observar as estimativas de produção feitas pelo MME nos Balanços Energéticos de 1976, 1977, 1978 e 1979. Como se verifica, o planejamento da tonelagem a produzir tem oscilado incrivelmente de ano para ano. Este tipo de estimativas espelha bem a indefinição e falta de consistência dos números governamentais na área do carvão, o que causa uma grande insegurança tanto nos consumidores - que não sabem se vai realmente haver carvão e a que preço - quanto nos produtores - que não sabem se haverá consumo para produções maiores e quais serão as condições do mercado.

Na área do carvão metalúrgico, nossa produção representou em 1979 apenas 24% do consumo e a previsão é de continuarmos a depender fortemente da importação, devendo nosso consumo duplicar nos próximos 5 anos como mostra a tabela 5.

Atualmente, o programa energético brasileiro prevê que até 1985 deveremos estar produzindo de carvão o equivalente a 170 mil barris por dia de óleo. Tal quantidade equivale a cerca de 27,5 milhões de toneladas/ano de carvão vapor o que significa mais de 5 vezes nossa atual produção. Apenas para se abrir as minas necessárias para atender a este consumo, seria necessário se investir cerca de US$ 2500 milhões em cerca de 22 novas minas grandes, o que dá uma média de 3,7 usinas por ano até 1985. Além disso, é necessário investir em sondagens, para a abertura das minas, mais Cr$ 2,5 bilhões uma vez que a malha de sondagens já feita não fornece as informações necessárias ao planejamento e à abertura das citadas minas. Ora, tendo em vista o pequeno porte das mineradoras hoje em atividade, deduz-se que esta meta dificilmente será atingida.

TABELA 4 - PRODUÇÃO NACIONAL DE CARVÃO EM 1.000 t

ANO	BALANÇO ENERGÉTICO NACIONAL - M.M.E.			
	1976	1977	1978	1979*
70	2.361	2.361	2.361	
71	2.505	2.505	2.505	
72	2.517	2.517	2.517	
73	2.327	2.327	2.327	
74	3.217	3.256	3.256	
75	2.760	2.762	2.762	
76	3.653	3.253	3.402	
77	4.012	3.990	3.987	
78	5.092	4.282	4.520	
79	6.089	4.643	4.468	
80	7.289	5.432	5.188	5.500
81	9.445	8.158	5.327	6.500
82	12.861	9.806	7.346	12.300
83	13.817	10.955	8.148	17.700
84	14.963	11.818	8.497	25.800
85	16.537	13.111	9.208	27.500

* NÃO INCLUI CARVÃO METALÚRGICO

TABELA 5 - ESTIMATIVAS DE IMPORTAÇÃO DE CARVÃO METALÚRGICO

ANO	10^3 t
1978	4.225
1979	3.969
1980	4.752
1981	5.392
1982	6.888
1983	7.321
1984	7.705
1985	9.097

FONTE: BALANÇO ENERGÉTICO NACIONAL - 1978.

Observe-se ainda que não há um sistema de transportes capaz de dar vazão à esta produção planejada uma vez que os portos e estradas de ferro atualmente disponíveis não comportarão tais volumes de carvão.

NOVAS ÁREAS DE MINERAÇÃO

Recentemente a Cia. de Pesquisas de Recursos Minerais - CPRM, colocou em licitação 6 novas áreas de mineração de carvão. São elas:

. Arroio da Silva	Santa Catarina
. Morro dos Conventos	
. Leão Norte 1	Rio Grande do Sul
. Leão Norte 2	
. Iruí Bloco Central 1	
. Iruí Bloco Central 2	
. Seival (Candiota)	
. Hulha Negra (Candiota)	

Estas áreas, de propriedade da CPRM, deverão ser repassadas a terceiros. Apresentaram-se como candidatos a estas áreas as 43 companhias da Tabela 6, dentre as quais as seis primeiras são multinacionais, o que mostra o interesse internacional pelo nosso carvão.

De todas estas áreas as únicas passíveis de mineração a céu aberto são as jazidas de Seival e Hulha Negra.

USOS DO CARVÃO MINERAL

Talvez o uso mais conhecido do carvão mineral seja na fabricação de coque para uso nos altos-fornos siderúrgicos. Entretanto, para esta aplicação específica, o carvão tem de ser coqueificável o que só ocorre com um fração do carvão Barro Branco de Santa Catarina (cerca de 50% do carvão da camada) e com o carvão do Bonito (cerca de 20% do carvão da camada). Mesmo assim, esta fração apresenta ainda um teor de cinzas bem alto, cerca de 18,5%, o que causa queda de produtividade nos altos-fornos.

O carvão que não se presta à fabricação do coque é denominado "carvão-vapor" ou "carvão energético" e se constitui na grande maioria de nossas reservas. Este carvão pode ter múltiplas aplicações conforme esquematizado na Figura 3.

TABELA 6 - COMPANHIAS QUE SE CANDIDATARAM ÀS UNIDADES MINEIRAS DE CARVÃO EM LICITAÇÃO PELA CPRM - 1980

1 - SHELL DO BRASIL
2 - HANNA DO BRASIL
3 - MILDER KAISER
4 - INTERNACIONAL DE ENGENHARIA
5 - CIA DE MINERAÇÃO MERIDIONAL
6 - LIQUID CARBONIC S.A.
7 - COPELMI
8 - CARBONÍFERA TREVISO
9 - CIA DE MINERAÇÃO DE CARVÃO BARRO BRANCO
10 - MINERAÇÃO PRÓSPERA
11 - URUSSANGA
12 - CARBONÍFERA CRICIÚMA
13 - CIA CARBONÍFERA CATARINENSE
14 - USIMINAS
15 - GRUPO VOTORANTIN
16 - CAMARGO CORREA
17 - CONSTRUTORA MENDES JR.

Continuação da Tabela 6:

18 - GRUPO BOZZANO - SIMONSEN
19 - CR ALMEIDA S.A.
20 - CRM
21 - COPEL
22 - PAULO ABIB ENG
23 - ANDRADE GUTIERREZ
24 - SACOMAR MÁQUINAS LTDA
25 - CIA BRASILEIRA CARBONÍFERA ARARANGUÁ
26 - CAMBUÍ
27 - WERCO - CIA INDUSTRIAL
28 - ITABIRA AGROINDUSTRIAL
29 - METANOL - PESQUISA E PROJETOS DE CARVÃO
30 - RIOFINEX DO BRASIL
31 - VERITAS S.A.
32 - CEESA
33 - CIA ADMINISTRATIVA MORRO VERMELHO
34 - SERVIX ENGENHARIA
35 - UNIVEL
36 - SESENGE
37 - TRIDENTE
38 - RUDINAX EXPORT
39 - SEEBLA
40 - SSM FOMENTO MINERAL
41 - FÁBIO PENTANO GUIMARÃES
42 - CIMOTA
43 - CIMIMAR (GRUPO MATARAZZO)

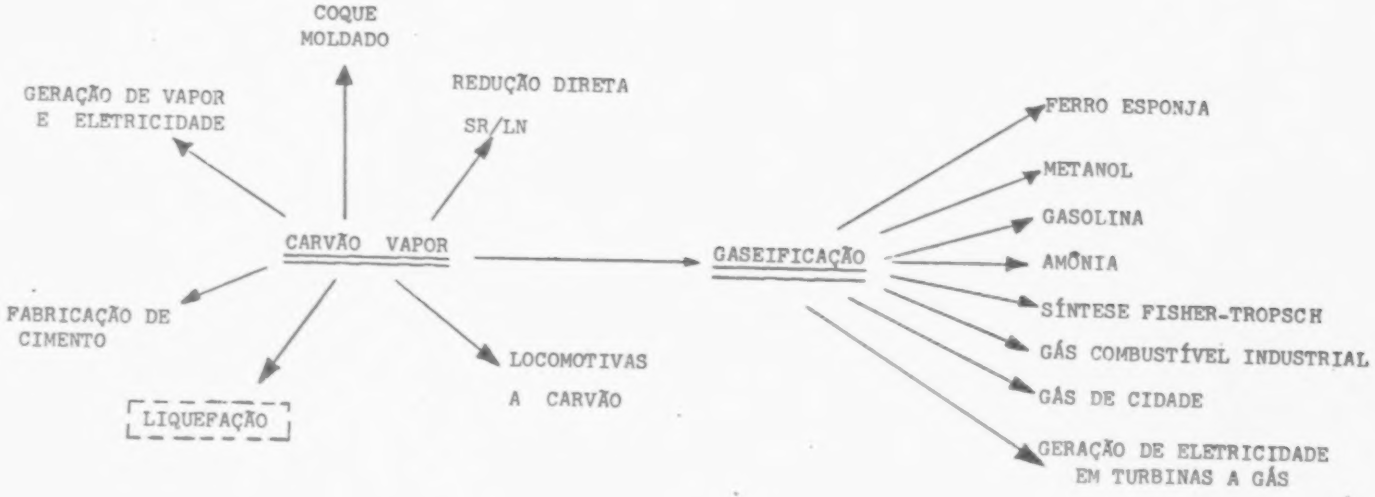


FIGURA 3 - USOS DO CARVÃO VAPOR

Entretanto, apesar das múltiplas possibilidades mostradas, o leque de usos no Brasil ainda é muito restrito, uma vez que a gaseificação, a qual abre um maior número de opções, ainda não foi realizada.

Em 1979 o uso do carvão se deu como mostrado na Tabela 7.

TABELA 7 - ESTRUTURA DO CONSUMO DO CARVÃO VAPOR EM 1979 NO BRASIL

CONSUMIDOR	%
Termoeletricidade	62
Estrada de ferro	1
Cimento, navegação, etc	37

A melhor alternativa para uso do carvão vapor nacional é, indiscutivelmente, na geração de eletricidade uma vez que permite o uso na boca da mina, sem necessidade de se transportar o carvão, e, consequentemente, suas cinzas, a longas distâncias. Além disso, para o país, é muito interessante se gerar eletricidade baseada em carvão, pois:

i) os investimentos na geração a carvão são cerca de 1/3 dos necessários para a geração de mesma capacidade usando urânio, (veja Tabela 8);

ii) o custo operacional da geração a carvão é muito inferior ao óleo combustível, custando a quilocaloria do carvão (sem subsídio) apenas 30% do valor da quilocaloria do óleo combustível (veja Tabela 9);

iii) o preço do carvão - abstraindo-se a inflação é constante, o que não tem ocorrido com o petróleo, cujo preço tem subido nos últimos anos a uma taxa real, descontada a inflação mundial, de cerca de 3% anuais;

iv) o carvão é uma matéria-prima nacional com as conseqüentes vantagens de segurança nacional e economia de divisas.

A ELETROBRÁS planeja expandir sua geração térmica a carvão somente após um longínquo 1992, prevendo entretanto, 7 usinas nucleares entre 1980 e 1992.

A área de produção de cimento será em 1985 responsável pelo consumo de 2,68 x 10^6 toneladas equivalentes de petróleo, o que significa uma evasão de divisas de cerca de US$ 442 milhões anuais. Parte substancial deste óleo poderia ser substituída por carvão. Entretanto, para isto há vários problemas. Do lado empresarial, o atual subsídio ao óleo combustível desestimula o empresário a usar o carvão , material este mais difícil de manusear e com grandes dificuldades de suprimento. Do lado governamental, a inexistência de um planejamento firme e coerente para a mineração, transporte e uso do carvão aliada à manutenção do subsídio ao óleo dificulta sobremaneira o encaminhamento do país para a solução de uma grande substituição do óleo combustível.

TABELA 8 - INVESTIMENTOS NA GERAÇÃO DE ELETRICIDADE

	US$ / Kw INSTALADO
HIDROELETRICIDADE	500 - 1000
TERMELÉTRICA A CARVÃO	900 - 1200
TERMELÉTRICA NUCLEAR	3000

TABELA 9 - CUSTO DA ENERGIA NO BRASIL (MAIO/80)

	US$ / Gcal	
GASOLINA "A"	68,7	
QUEROSENE	38,0	
DIESEL	27,7	
ÓLEO COMBUSTÍVEL ATE	8,6	16,1(1)
ÓLEO COMBUSTÍVEL BTE	10,5	17,1(1)
GÁS NATURAL		
- PARA FERTILIZANTES	2,7	
- PARA PETROQUÍMICA	7,3	
- PARA COMBUSTÍVEL	11,3	
GÁS DE CIDADE		
- RIO DE JANEIRO	31,3(2)	
GÁS DE CARVÃO		
- C/ 2 GASEIFICADORES	19,3	
- C/ 4 GASEIFICADORES	16,7	
PETRÓLEO		
. IRAQUE BASRAH LEVE (29,96)	20,5	
. IRÃ SASSAN (33,10)	22,4	
. ARÁBIA SAUDITA (LEVE) (28,00)	19,1	
. ARGÉLIA (38,21)	26,8	
CARVÃO		
. CARVÃO VAPOR SC (SEM SUBSÍDIO)	4,8	
. CARVÃO CANDIOTA (SEM SUBSÍDIO)	1,2	

notas: (1) custo real para o país
(2) a matéria-prima é nafta subsidiada

Existe um protocolo firmado entre os empresários de cimento e o governo federal prevendo a total substituição do óleo por carvão até 1985. Entretanto, além de uma substituição desta ordem ser de difícil realização técnica, as indefinições de mercado e preço levam à conclusão de que tal protocolo não será obedecido.

O uso de carvão vapor em locomotivas não é aparentemente viável em larga escala e se restringe hoje à Estrada de Ferro Tereza Cristina.

A Aços Finos Piratini dispõe de um forno há 7 anos que usa carvão vapor com 30% de cinzas no processo de redução direta SRLN. A vantagem do uso deste tipo de processo é a possibilidade de se usar carvão vapor em lugar de carvão metalúrgico para a produção de aço. Há entretanto, alguns problemas técnicos relacionados com o tipo de carvão e o processo SRLN que somente estão sendo resolvidos agora. Atualmente, a Aços Finos Piratini usa carvão da Mina de Recreio da Copelmi, carvão este vindo da mesma bacia carbonífera do Leão.

GASEIFICAÇÃO

A gaseificação do carvão vapor é também uma grande opção para o uso desta fonte de energia nacional. A partir da gaseificação uma série de produtos podem ser obtidos. Vejamos resumidamente cada um deles.

O gás de carvão, tanto o obtido no processo Koppers-Totzek quanto o obtido no processo Lurgi, pode ser usado como redutor nos processos de redução direta Hyl e Midrex, processos esses já em operação comercial há vários anos.

Estes processos fornecem ferro esponja o qual substitui a sucata nos fornos elétricos de produção de aço. A produção de tal sucedâneo da sucata é altamente desejável pois a sucata no Brasil tem mantido uma tendência crescente de escassez com a conseqüente elevação do seu preço. Estudos recentes mostram que uma planta de gasei ficação de carvão acoplada a um forno de redução Midrex permite produzir aço acabado com uma taxa de retorno para o empreendimento de 6% ao ano, o que, em termos de siderurgia se mostra ser altamente interessante.

A partir de gás de carvão se pode sintetizar metanol, em grandes unidades (5.000 t/d) para se tirar partido da economia da escala, metanol este que se poderia utilizar diretamente como substituto da gasolina automotiva de modo similar ao etanol. Testes de desempenho de automóveis a metanol foram realizados em 1976 exaustivamente pela Volkswagen na Alemanha e nos Estados Unidos quando então se demonstrou a sua viabilidade.

Além do uso direto do metanol nos motores, a Mobil Oil desenvolveu recentemente um processo para a transformação do metanol em gasolina o qual indica ser possível se obter gasolina a um preço de Cr$ 15,60 / litro, quando se remunera o capital à taxa de 12% ao ano.

Outra utilização interessante para o metanol é como vetor energético na produção de gás de cidade por meio de reforma com vapor. Assim, a energia do carvão poderia ser transportada a longas distâncias e seria viável se atender cidades de porte relativamente pequeno.

Usando-se o gás de síntese, obtido na gaseificação, pode-se também produzir amônia. Estudos efetuados pela PETROBRÁS mostram que o custo final da amônia, remunerando-se o investimento a uma taxa de 5%, é da ordem de US$ 360,5/tonelada . Este preço é realmente muito alto se comparado com o preço da amônia importada que é de US$ 215/t. Entretanto, o preço da amônia produzida a partir de óleo combustível (considerando-se o seu custo real para o país de US$ 165 / t) atinge, nas mesmas condições de remuneração do capital, US$ 358,3.

Uma outra possibilidade de obter combustíveis líquidos a partir do carvão é através da síntese de Fisher-Tropsch. Este caminho foi adotado pela África do Sul que irá produzir, quando todo o projeto SASOL estiver terminado, cerca de 107.000 barris por dia de petróleo, o que deverá garantir quase metade do consumo de petróleo do país.

Atualmente, a planta da SASOL, fase II, se encontra em final de montagem, devendo ser iniciada a produção ainda em 1980. O investimento na SASOL II, para a produção de 50.000 barris por dia, foi de cerca de US$ 3 bilhões e estima-se que o barril de petróleo sintético custará US$ 43. Comparando-se este preço com os dos petróleos de alguns países como Argélia (US$ 38,21/bbl), Irã (US $ 34,45/bbl) e Líbia (US$ 34,12/bbl) vê-se que o petróleo obtido pela síntese Fisher-Tropsch não é tão caro como parece à primeira vista. Se for efetuada uma comparação com os preços atingidos no "spot market", onde o petróleo chegou, em data recente, a ser cotado a US$ 42/bbl deduz que a opção adotada pela África do Sul é bastante razoáve.

Um produto evidente e extremamente interessante em certos casos é o gás combustível de carvão. Este gás combustível pode ser de alto ou de médio poder calorífico. O gás de alto poder calorífico é normalmente conhecido como SNG (gás natural sintético) e só é razoável ser produzido em locais onde haja tradição e/ou facilidades já instaladas para o consumo e transporte de gás natural. Este é o caso, por exemplo, dos Estados Unidos onde há uma fantástica rede de gasodutos para distribuição de gás natural. Entretanto, no caso do Brasil o SNG não se justifica por várias razões:

- não há uma rede de distribuição de gás natural;
- não há tradição de uso de gás natural no país, exceto em pequeníssimas áreas da Bahia;
- a eficiência do processo de obtenção de SNG a partir do gás bruto de carvão é muito baixa;
- o processo de metanação do gás de carvão ainda não se encontra comercialmente provado.

Entretanto, o gás de médio poder calorífico pode ser utilizado, seja na indústria seja como gás de cidade. Como gás industrial não há nenhum problema na sua utilização e o seu custo de produção, é cerca de US$ 21/Gcal ou US$ 33,65/bbl de óleo equivalente remunerando-se o capital a 5% ao ano. Deve-se ressaltar que este preço se refere a um gás dessulfurado que tem grandes vantagens de ser usado em zonas de grande concentração industrial, pois o nível de poluição atmosférica poderia ser muito diminuído com o seu uso em lugar dos óleos combustíveis usuais que têm até 5% de enxofre.

O gás de cidade, atualmente produzido a partir de nafta, é vendido ao consumidor por US$ 31,3/Gcal e este gás poderia ser substituído por gás de carvão um pouco diferente do gás industrial citado a um preço pouco acima dos US$ 21/Gcal.

A liquefação direta de carvão é um campo atualmente em desenvolvimento e se apresenta como muito promissor para a década de 90, mas hoje existem apenas unidades piloto e de demonstração de novos processos.

PROJETOS EM ESTUDO PELA PETROBRÁS

A PETROBRÁS realizou já três estudos detalhados de gaseificação de carvão. O primeiro deles é um projeto para a produção de 600 t/d de amônia no Rio Grande do Sul em associação com a Cia Riograndense de Nitrogenados. O investimento total deste projeto seria de US$ 266 milhões, cabendo à PETROBRÁS US$ 168 milhões. A planta deverá se localizar em São Jerônimo, às margens do Rio Jacuí.

O segundo é alternativo ao primeiro e prevê a produção de gás combustível para suprir toda a demanda de óleo combustível da REFAP. A economia de óleo seria de 2.800 barris por dia e o investimento total da ordem de US$ 137 milhões incluindo o gasoduto São Jerônimo-REFAP.

O terceiro projeto seria em Tubarão, Santa Catarina, para a produção de 520.000 toneladas anuais de ferro esponja usando redução direta a gás de carvão. Esta planta, um empreendimento conjunto

PETROBRÁS-SIDERBRÁS, atenderia à demanda de ferro esponja da fábrica de tubos da SANTAINVEST, sendo o excedente de ferro esponja colocado no mercado como complemento da demanda de sucata.

PANORAMA MUNDIAL

As grandes companhias multinacionais de petróleo têm, nos últimos anos, investido significativamente em carvão e em outros minerais. Atualmente, 11 companhias de petróleo detêm, nos Estados Unidos, 55,3 bilhões de toneladas de carvão o que representa 25% das reservas recuperáveis americanas.

Vejamos, resumidamente, a atuação de cada uma das grandes companhias de óleo na área de carvão:

1). SHELL

- A Shell é, atualmente, dona da Seaway Coal, Ohio, emprêsa esta que produz cerca de 3,6 milhões de toneladas de carvão por ano.
- Êste ano deverá entrar em operação uma nova mina de sua propriedade, na África do Sul, que irá produzir mais 3 milhões de toneladas/ano.
- Além disso, a Shell está prospectando carvão no Canadá, em Botswana e em Swaziland.
- No Brasil a Shell descobriu em 1974 o linhito de Atalaia do Norte, no Alto Amazonas, e se candidatou às áreas postas em licitação pela CPRM.
- Na área de tecnologia, a Shell está desenvolvendo o processo de gaseificação de carvão Shell-Koppers o qual já dispõe de uma unidade de demonstração de 150 t/d de carvão. Esta planta se encontra em funcionamento em Harburg, Alemanha e deverá fornecer dados de projeto para a primeira planta industrial a qual deverá ser construída na Holanda por volta de 1985.

2). EXXON CORPORATION

- A Exxon detem hoje a quarta maior reserva de carvão dos Estados Unidos, com 9,3 bilhões de toneladas de carvão.
- A Exxon está atuando, na área de carvão, através de duas subsidiárias: Carter Oil Co. e Monterey Coal Co. Estas duas companhias produziram 5,2 milhões de toneladas de carvão em 1979 e planejam produzir 36 milhões em 1985.

3). MOBIL CORPORATION

- Detem uma reserva de 3,7 bilhões de toneladas de carvão.
- Atualmente ainda não produz nada mas espera-se que, em 1985, já se produza um mínimo de 15 milhões de toneladas/ano.
- A Mobil está desenvolvendo o processo Mobil para produção de gasolina a partir de metanol de carvão.

4). GULF OIL CORPORATION

- É dona da Pittsburg & Midway Coal Mining Co., que produziu, em 1979, 8 milhões de toneladas de carvão. Está em andamento ' uma expansão, no valor de US$100 milhões, visando aumentar a produção para 25 milhões/ano dentro de seis anos.
- Está desenvolvendo o processo de liquefação de carvão SRC- Solvent Refinel Coal.
- Está também desenvolvendo um novo processo de produção de gás de baixo poder calorifico.

5). TEXACO

- Está desenvolvendo o processo de gaseificação de carvão Texaco, tendo já uma planta de demonstração em funcionamento na Alemanha.

6). OCCIDENTAL PETROLEUM

- É dona da maior companhia americana de carvão: Island Creek.

7). BRITISH PETROLEUM

- Adquiriu a Old Ben Coal (Illinois, Indiana e Virginia), cuja produção em ' 1976 foi de 8,1 milhões de toneladas.
- Assumiu o Projeto Clutha New South Wales, Austrália por US$390 milhões.
- É sócia no Projeto Ermelo de carvão na África do Sul.

8). CONOCO

- Dona da segunda maior companhia de carvão americana: a Consolidation Coal.
- A Consolidation Coal está desenvolvendo o processo de gaseificação de carvão "CO_2 Acceptor".
- Em 1985, a Consolidation Coal planeja produzir 75 milhões de toneladas de ' carvão.

9). GETTY OIL

- Está planejando produzir 5,4 milhões de toneladas de linhito por ano no Texas.

ANEXO I : TABELA DE PREÇOS DOS CARVÕES - VAPOR

A PARTIR DE 01/04/80

CONSELHO NACIONAL DO PETRÓLEO

COMPANHIA AUXILIAR DE EMPRESAS ELÉTRICAS BRASILEIRAS

VIGÊNCIA
a partir de
01/04/80

COMERCIALIZAÇÃO DO CARVÃO DE PRODUÇÃO NACIONAL NÃO APLICÁVEL NA PRODUÇÃO DE COQUE

ESTADO PRODUTOR	EMPRESA PRODUTORA	TIPO DE CARVÃO MINA	PC APROXIMADO kcal/kg	PREÇO VIGENTE DE VENDA DO PRODUTOR		PREÇO DE COMERCIALIZAÇÃO		ÔNUS DO CNP		OBSERVAÇÕES
				ATO	Cr$/t	ATO	Cr$/t	Cr$/t	%	
R.G. SUL	CRM	BRUTO (CANDIOTA)	3.200	Portaria CNP nº PC-02/80, de 27/03/80, com vigência a partir de 01/04/80.	184,00	Portaria CNP nº PC-03/80, de 27/03/80, com vigência a partir de 01/04/80.	73,00	111,00	60,3	Preço base de comercializaçã
		GRAUDO (LEÃO)	4.400		996,00		398,00	598,00	60,0	
	COPELMI	TECH (CHARQUEADA)(1)	3.100		709,00		283,00	426,00	60,0	
		(RECREIO) (2)	4.400							
S.CATARINA	GRUPOS A + B	VAPOR SECUNDÁRIO (SOTELCA) (3)	4.500		962,61 + 111,46(4) 1.074,07		385,00 + 44,58 429,58	644,49	60,0	Frete Mina-Capivari 40% de cinzas
			5.500		1.305,10		521,98	783,12	60,0	34% de cinzas
PARANÁ	CAMBUÍ	BRUTO			573,00					
		GROSSO (FIGUEIRA)	6.000		936,00		374,00	562,00	60,0	
		FINO (FIGUEIRA)	6.000		845,00		338,00	507,00	60,0	

NOTAS: (1) - O carvão TECH tem o PC definido em 3.100 kcal/kg ± 5%, ficando portanto igual ao PC de Candiota: 3.200 kcal/kg.
(2) - Frete rodoviário de Cr$ 84,53/t entre a Mina do Recreio e Charqueada, autorizado pelo CNP, a partir de 01/01/80.

(3) - SOTELCA: produzido em Capivari. Cinza padrão = 40%
(4) - Frete, base seca, com arredondamento: Cr$111,46 a partir de 01/04/80, conforme ofício CNP-SC-208/80, de 27/03/80. (proc. 505.156/79). Para o carvão embarcado em Rio Fiorita, o frete é Cr$ 123,55.

ANEXO II

COMPOSIÇÃO DO CUSTO DO TRANSPORTE DE CARVÃO DE SANTA CATARINA

maio/1980

		Cr$/t
1)-	Carregamento vagões em Tubarão	28,00
	Transporte Tubarão-Imbituba	90,00
	Despesas Portuárias Imbituba	102,00
	SUB-TOTAL:	220,00
2)-	FRETE MARÍTIMO	
	Imbituba - Santos	440,00
	Imbituba - Antonina	388,00
	Imbituba - Rio	490,00
3)-	DESPESAS PORTUÁRIAS	
	Porto de Santos	165,00
	Porto de Antonina	220,00
	Porto do Rio	80,00
4)-	DOCAS - DEPÓSITO DA CAEEB	
	Santos	123,00
	Antonina	40,00
	Rio	70,00
5)-	TOTAIS	
	Tubarão - Santos	948,00
	- Antonina	868,00
	- Rio	860,00

FONTE: CAEEB.

ANEXO III: LISTA DE ENTIDADES ENVOLVIDAS COM

CARVÃO NO BRASIL

QUADRO 6A

PROCESSO PRODUÇÃO DE SÓLIDOS LÍQ. E GASES	PROPRIETÁRIO PRINCIPAL	TEMPO DE DES. (ANOS)	STATUS
BERGIUS	F.BERGIUS	50	OBSOLETO
CCL-CATALYTIC COAL LIQUEFACTION	GULF OIL CORP.	12	PRÉ-COMERCIAL
CLEAN COKE PROCESS	U.S.STEEL CORP.	7	COMERCIAL
COALCON HYDROCARBONIZATION	UNION CARBIDE + CHEMICO	30	PRÉ-COMERCIAL
COALPLEX	CITY COLLE OF N.Y.	4	PRÉ-PILOTO
COED	FMC. CORP.	17	COMERCIAL
C.O.G (COAL-OIL-GÁS REFINERY	GULF OIL CORP.	9	-o-
COGAS	(VÁRIAS EMPRESAS)	7	DEMONSTRAÇÃO
CONSOL SYNTHETIC FUEL	CONTINENTAL OIL CO.	16	PRÉ-COMERCIAL
COSTEAM	U.S.B.M.	-	PILOTO
EXTRATIVE-COKING PROCESS	ARTHUR D.LITTLE	-	DEMONSTRAÇÃO
EXXON LIQUEFACTION	EXXON CORP.	-	-o-
FISHER-TROPSCH	F.T. + KEL'OG + OUTROS	45	COMERCIAL
GARRET'S COAL PYROLYSIS	GARRET + OCIDENTAL PETROLEAN CO.	-	PILOTO
GAS EXTRACTION	COAL RESEARCH ESTABLISHMENT	-	PILOTO
H-COAL	PINAELECTRON CO.	14	-o-
HYDRO CRACKING PROCESS	CONTINENTAL OIL CO.	5	-o-
INTERMEDIATE HYDROGENATION	UNIVERSITY OF UTAH	10	DEMONSTRAÇÃO
LEAL LIQUEFACTION	LEA BRAS.DEV.CO.	6	-o-
LURG - RUHRGAS	LURG GMB	16	COMERCIAL
METHANOL SYNTESIS	(VÁRIOS PROJETOS)	-	-o-
MOLTEN SALT CATALYSIS	MONTANA S.UNIV.	-	DEMONSTRAÇÃO

CARVÃO NO BRASIL: SITUAÇÃO E PERSPECTIVAS

I - HISTÓRICO

Muito antes de desencadeada a chamada "crise do petróleo" o governo brasileiro já se preocupava em determinar o volume de reservas de carvão no Brasil.

Inicialmente através da Comissão do Plano de Carvão Nacional - CPCAN, que a partir de 1964 acelerou os trabalhos de prospecção, realizando pesquisas em diversas áreas do território nacional, como nos Estados do Piauí e do Pará, sem contar nas áreas produtoras dos três Estados da Região Sul.

Com a extinção da CPCAN em janeiro de 1971, as atribuições desse órgão passaram para o Departamento Nacional da Produção Mineral - DNPM, na parte relativa a orientação na pesquisa geológica e lavra do carvão, e ao Conselho Nacional de Petróleo - CNP, referente a quotas de produção, controle da qualidade do carvão e sua comercialização.

Já no final de 1970 e durante toda a década passada, um intenso programa de prospecção foi executado através do convênio DNPM/CPRM, e uma elevada soma de recursos foi empregada, principalmente em sondagem.

A pesquisa geológica visou inicialmente a ampliação das reservas conhecidas de carvão coqueificável, em virtude da crescente demanda do Plano Siderúrgico Nacional. Visava principalmente achar áreas com carvão de melhor qualidade, objetivando uma participação maior do carvão nacional na mistura com o carvão importado, para produzir o coque siderúrgico e diminuir a importação de carvão metalúrgico, que já pesava demasiadamente na balança comercial brasileira.

Porém, em face da crise energética mundial e, a necessidade urgente de substituição das fontes externas de energia por fontes nacionais, o carvão mineral, aparentemente estático, recebeu novo impulso, e as reservas de carvão vapor, até então pouco utilizadas, foram amplamente valorizadas, abrindo-se o leque de aplicações além da termoeletricidade, como na gaseificação, na liquefação, na carboquímica, na indústria cimenteira, nas fábricas de papel e celulose, na indústria cerâmica, e outras de menor demanda.

Esses trabalhos de pesquisa utilizando recursos ordinários do DNPM, desenvolveram-se de 1970 a 1979.

Como principais resultados daquele decênio de trabalhos a descoberta de grandes recursos em linhito na região do Alto Solimões (Amazonas) e a ampliação das reservas de carvão "in situ" da Bacia do Paraná, passando de 2,71 x 10^9t em 1970 para 22,77 x 10^9t em 1979.

Como consequência também desses trabalhos foi descoberto em 1976, carvão com características coqueificantes na região de Morungava, Rio Grande do Sul, evidenciando pela primeira vez carvões com essas características fora da Bacia Carbonífera Catarinense.

A partir de 1980, o DNPM encajou-se no Programa de Mobilização Energética, participando não só como analisador dos vários projetos de pesquisa e lavra que dão entrada no Ministério das Minas e Energia solicitando financiamento, como também no planejamento de um Programa Básico de Prospecção de Carvão, Linhito e Turfa em todo território nacional.

II - RECURSOS FINANCEIROS

Até fins de 1979 o DNPM só contava com recursos ordinários, recursos esses que foram se escasseando a partir de 1975.

Embora com recursos insuficientes, os trabalhos de pesquisa desenvolveram-se com grande objetividade, permitindo uma evolução das reservas conhecidas (anexo I).

Essas reservas em relação às necessidades brasileiras representam cerca de 7.789,49 x 10^6 toneladas equivalentes de petróleo, o que permite considerar o carvão mineral como a opção mais viável para substituição dos derivados de petróleo nos vários segmentos onde estes últimos são solicitados.

Com a criação do Programa de Mobilização Energética através do Decreto-Lei 1691 de 02/08/79, os vários órgãos responsáveis pela política energética do país puderam ter recursos específicos na procura de soluções para amenizar a crise energética que assola o país.

Dentro do PME o DNPM apresentou um Projeto Básico de Prospecção de Carvão, Linhito e Turfa e de Desenvolvimento de Tecnologia para o período de 1980-1985, estando atualmente em desenvolvimento.

No ano de 1980 o DNPM contou com Cr$615.000.000,00 e a CPRM para pesquisa própria com Cr$ 1.215.000.000,00, de um total de Cr$ 11.235.873.000,00 empenhados pelo Ministério das Minas e Energia para atender os vários convênios assinados com órgãos ligados ao setor energético.

Em 1981 o DNPM conta com Cr$ 667.700.000,00 e a CPRM Cr$ 1.500.000.000,00, de um total de Cr$ 16.200.000.000,00 que coube ao MME.

III - RESERVAS E RECURSOS

Embora a desproporção nas liberações de 1980 e 1981 para o setor da pesquisa, em relação ao montante liberado para outros fins, foi possível ao DNPM prosseguir em seu trabalho de pesquisa, delimitando e detalhando áreas para abertura de novas minas, fornecendo os subsídios técnicos para ampliação da produção das minas já existentes através de mecanização, desenvolvendo trabalhos pioneiros nos mais variados pontos do país, procurando evidenciar novas jazidas de carvão, linhito e turfa.

A situação atual das reservas e recursos de carvão linhito e turfa no Brasil é a seguinte:

No Alto Solimões (Amazonas) trabalhos executados em 1975-1976 determinaram recursos em linhito da ordem de 36,9 x 10^9 toneladas para uma área de 90.062 km^2. Atualmente estuda-se a implantação de pequenos gaseificadores em núcleos populacionais existentes na região na tentativa de fornecer energia elétrica, hoje toda na base de motores a diesel.

Na Bacia do Paraná as reservas conhecidas são de 22,8 x 10^9 toneladas de carvão "in situ".

No litoral nordestino, estendendo-se da Bahia ao Rio Grande do Norte já podemos contar com 83,7 x 10^6 m^3 de turfa energética e 150,6 x 10^6 m^3 de turfa agrícola.

Embora carente de estudos mais detalhados, já são estimados recursos em turfa da ordem de 600 x 10^6t no Espírito

Santo,680 x 10^6t no Vale do Rio Paraíba do Sul, 40 x 10^6t no Estado do Rio de Janeiro.

Outras áreas como na região dos rios Madeira, Purus e Canumã no Amazonas, regiões de Belém e Santarém no Pará , Pantanal Mato-grossense e Ilha do Bananal na região Centro-Oeste, são potencialmente favoráveis a conter imensas reservas de turfa. Essas áreas estão na programação do DNPM para 1982 visando a prospecção para turfa e linhito.

Estima-se que para todo o Brasil teremos reservas em turfa da ordem de 25 bilhões de toneladas.

IV - PRODUÇÃO DE CARVÃO

As metas inicialmente estabelecidas de 27,5 x 10^6t de carvão utilizável para o ano de 1985 foram consideradas inviáveis.

O modelo energético atual prevê uma produção de 17,0 x 10^6t de carvão em 1985, meta essa possível de ser atingida como mostra o quadro de produção das minas (Anexo II).

A produção de carvão utilizável nos últimos 3 anos foi de:

1978	4.438.793 t
1979	4.813.580 t
1980	5.241.586 t

Para atingir aquela produção em 1985, ou seja multiplicar a produção de 1980 por 3,2, significa que as novas minas previstas para entrar em operação nos anos de 1982-1983-1984, deverão fazê-lo. Caso contrário, logicamente, a meta não será atingida. Daí a necessidade de recursos financeiros.

As novas minas que deverão receber recursos do PME foram aquelas que reuniram condições técnicas e situavam-se próximas aos ramais rodoviários e ferroviários, o que permitiria o escoamento da produção.

V - CONSIDERAÇÕES FINAIS

Verifica-se pelos dados de produção dos três últimos anos que o aumento não ultrapassou a taxa de 10% ao ano.

A produção prevista para 1985, da ordem de 17 milhões de toneladas poderá ser atingida, uma vez que recursos tem sido liberados para abertura das novas minas. Essas deverão entrar em produção a partir de 1982 e assim contribuirão para atingir a meta almejada.

Todavia, é importante frisar que esse aumento de 5,2 x 10^6t para 17,0 x 10^6t, embora menor do que o previsto anteriormente, deve ser encarado do mesmo modo com muito cuidado e atenção, em função do impacto que causará sobre o meio ambiente.

O Plano do Carvão Nacional, embora sem o ímpeto colocado no papel, vem sendo desenvolvido, na prática, normalmente, liberando-se recursos financeiros para aqueles mineradores tradicionais que tem mostrado capacidade para levar avante o empreendimento. Esse caminhar gradual, a nosso ver, é salutar pois permitirá antever erros e contorná-los, fazendo com que a corrida ao carvão seja realmente uma solução do problema energético e não um aumento de preocupações ao nosso País.

Brasília, 26 de agosto de 1981

Benedicto Waldir Ramos
Geólogo
DNPM / DGM

BACIA DO PARANÁ

EVOLUÇÃO DAS RESERVAS DE CARVÃO "IN SITU"

ESTADOS	RESERVAS x 10^6t	1970	1971	1973	1975	1977	1978	1979	1980
São Paulo	Medida	-	-	-	2,0	2,0	2,0	2,0	2,00
	Indicada	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,00
	Inferida	-	-	-	-	7,0	7,0	7,0	7,02
	TOTAL	1,0	1,0	1,0	3,0	10,0	10,0	10,0	10,02
Paraná	Medida	-	-	-	25,0	32,0	32,0	32,0	32,04
	Indicada	31,0	31,0	37,0	25,0	27,0	27,0	27,0	57,74
	Inferida	-	-	-	-	5,0	5,0	5,0	2,00
	TOTAL	31,0	31,0	37,0	50,0	64,0	64,0	64,0	91,78
Santa Catarina	Medida	-	-	268,9	270,1	363,2	369,31	369,31	379,31
	Indicada	270,0	270,0	491,7	593,6	825,4	859,07	859,07	859,07
	Inferida	-	935,0	602,2	831,8	667,2	712,86	712,86	702,86
	TOTAL	270,0	1205,0	1362,8	1695,5	1855,8	1941,24	1941,24	1941,24
Rio Grande do Sul	Medida	-	169,0	759,0	789,0	927,42	947,50	947,50	1786,46
	Indicada	387,0	387,0	440,0	513,0	1786,37	2597,80	2597,80	3544,01
	Inferida	2022,0	1853,0	2347,0	9044,0	16247,41	15713,65	17212,70	15437,53
	TOTAL	2409,0	2409,0	3546,0	10346,0	18961,20	19258,95	20756,00	20768,00
Brasil	Medida	-	169,0	1027,9	1086,1	1324,62	1324,62	1350,81	2199,81
	Indicada	689,0	689,0	969,7	1132,6	2639,77	3484,87	3484,87	4461,82
	Inferida	2022,0	2788,0	2949,2	9875,8	16926,61	16438,51	17937,56	16152,41
	TOTAL GERAL	2711,0	3646,0	4946,8	12094,5	20891,00	21248,00	22773,24	22814,04

Fonte: DNPM-CPRM-COPELMI-CRM

(Revisto e atualizado em 17/08/81)

ANEXO I

CAEEB

Carvão-Brasil

PERSPECTIVAS DO CARVÃO ENERGÉTICO

Palestra Proferida Pelo Presidente
da CAEEB
Dr. NEY WEBSTER ARAUJO

Clube de Engenharia - Rio de Janeiro
Outubro/1980.

②

I - INTRODUÇÃO

O Modelo Energético Brasileiro divulgou as diretrizes e metas quantitativas que representam a resposta do País à crise mundial de combustíveis líquidos.

Esse documento determina que o carvão mineral nacional seja o insumo energético encarregado de substituir o óleo combustível, basicamente na região Sul e Sudeste do Brasil.

É importantissimo termos consciência desse fato pois se o carvão, por qualquer motivo não conseguir desempenhar o papel que lhe foi reservado, todo o esforço do Governo em resolver o problema energético se frustará, mesmo considerando o pleno sucesso do Proalcool, por exemplo. Isso porque, dada a relativa rigidez do esquema de Refino, a substituição de um determinado derivado (o álcool por gasolina), isoladamente, não solucionará o problema energético nacional, porque os demais derivados, obviamente exigirão as mesmas importações de petróleo.

Quanto ao carvão é digno de se mencionar que sua relativa marginalização no quadro dos energéticos nacionais está exigindo, agora, consideráveis esforços de toda a nação. Aliás, em termos de consumo per-capita/ano o carvão se situa a nível de 75 kg, no Brasil, enquanto que nos Estados Unidos esse nível é de 2.500 kg, ou seja 33 vezes mais. Em 1979, o carvão mineral representou apenas 4,3% do consumo de energia primária.

Pelos dados inicialmente destacados, esse perfil de consumo compulsoriamente tem que mudar, há de mudar, e nós todos vamos concorrer para mudá-lo.

Relembramos que as metas estabelecidas para o carvão nacional determina uma produção adicional de 22,5 milhões de toneladas até 1985, orientadas para a substituição de óleo combustível.

CAEEB ③

QUADRO I

RESERVAS BRASILEIRAS DE CARVÃO MINERAL

	RESERVAS 10^6 toneladas			
ESTADO	MEDIDAS	INDICADAS	INFERIDAS	TOTAL
RGS	947,50	2.597,80	17.212,70	20.758,0
SC	369,30	859,07	712,86	1.941,2
PR	32	27	5	64
SP	2	1	7	10
TOTAIS	1.350,8	3.484,87	17.937,56	22.773,2

Fonte: DNPM, Dezembro 1979

PRODUÇAO DE CARVÃO NO RIO GRANDE DO SUL

POR TIPO - 1º SEMESTRE-1980

10^3t

TIPO	COPELMI	CRM	TOTAL
20% cz	-	28,2	28,2
35% cz	76,8	46,9	123,7
40% cz	94,8	147,9	242,7
52% cz	92,3	242,2	334,5
TOTAL	263,9	465,2	729,1

ESTIMATIVA DE PRODUÇÃO DE CARVÃO NO RIO GRANDE DO SUL
POR TIPO

1981 - 1985

10^3t

TIPO DE CARVÃO	1981	1982	1983	1984	1985
52 /54%	1.098	1.098	2.898	4.898	4.898
47%cz	40	240	540	1.100	1.972
40%cz	270	180	400	650	930
35%cz	1.238	2.064	2.784	5.214	7.084
20%cz	60	60	190	270	350
TOTAL	2.706	3.642	6.812	12.132	15.234

FONTE: CRM, COPELMI e CPRM. - Setembro/80

Fig.3

PRODUÇÃO DE CARVÃO DE SANTA CARARINA - POR TIPO
1º SEMESTRE 1980

TIPO DE CARVÃO	PRODUÇÃO (10^3t)
35%cz	123,2
40%cz	551,0
TOTAL	674,2

ESTIMATIVA DE PRODUÇÃO DE CARVÃO EM SANTA CATARINA.
POR TIPO
1981 - 1985

10^3t

TIPO DE CARVÃO	1981	1982	1983	1984	1985
35%cz	1.236	2.160	2.851	3.101	6.063
40%cz	1.080	1.080	1.080	1.080	1.080
TOTAL	2.316	3.240	3.931	4 181	7.143

FONTE: Companhias de Mineração - Setembro/80

Fig. 4

⑥

PRODUÇÃO DE CARVÃO DO PARANÁ
POR TIPO - 1º SEMESTRE-1980

TIPO DE	PRODUÇÃO (10^3t)
20%cz	105,3

ESTIMATIVA PRELIMINAR DE PRODUÇÃO
DE CARVÃO NO PARANÁ - POR TIPO
1981 - 1985

ANO	PRODUÇÃO (10^3t)
1981	336
1982	413
1983	525
1984	1.022
1985	1.344

Fig.5

⑦

CAEEB

PRODUÇÃO NACIONAL DE CARVÃO - POR TIPO
1º SEMESTRE - 1980

TIPO DE CARVÃO	PRODUÇÃO (10^3t)
20%cz	133,5
35%cz	246,9
40%cz	793,7
52%cz	333,5
TOTAL	1.507,6

ESTIMATIVA DA PRODUÇÃO NACIONAL - POR TIPO
1981 - 1985

TIPO DE CARVÃO	1981	1982	1983	1984	1985
20%cz	396	473	715	1.292	1.694
35%cz	2.474	4.224	5.635	8.315	13.147
40%cz	1.350	1.260	1.480	1.730	2.010
47%cz	40	240	540	1.100	1.010
52%cz	1.098	1.098	2.898	4.898	4.398
TOTAL	5.358	7.295	11.268	17.335	23.721

Fig. 6

3.5 - Projetos já submetidos À CAEEB

. Rio Grande do Sul

CRM - Mina de Iruí
Mina de Leão II
Mina de Candiota (ampliação)

COPELMI - Mina do Recreio (ampliação)
Mina de Triunfo

Produção prevista - $11,2 \times 10^6$ t (ROM)/ano.
Investimentos previstos - US$ 300×10^6

. Santa Catarina

C.B.C. Araranguá - Mina 3
C.C. Criciúma - Mina 2
C.C. Urussanga - Mina Rio América
Mina Rio Caeté

Produção prevista - $2,4 \times 10^6$ t(CPL)/ano.
Investimentos previstos - US$ $66,0 \times 10^6$

3.6 - Projetos em fase de elaboração

. Rio Grande do Sul - 10 projetos de novas minas com capacidade instalada de $18,5 \times 10^6$ t(ROM)/ano.

. Santa Catarina - 14 projetos de novas minas e 7 projetos de ampliação de capacidade de minas já em operação. Total de capacidade instalada de $6,7 \times 10^6$ t(CPL)/ano.

. Paraná - 1 projeto de nova mina e ampliação da mina atual, com capacidade de .... $1,6 \times 10^6$ t(ROM)/ano.

3.7 - Total da produção nacional

A consolidação da produção nacional prevista é da ordem de $60,0 \times 10^6$ t(ROM)/ano.

QUADRO VIII

CAPACIDADE DE BENEFICIAMENTO

(ATUAL E PROJETADA)

ESTADOS	CAPACIDADES (EM 10^6t de R.O.M.)		
	ATUAL	EM 1985 (PREVISTA)	DÉFICIT
RS	1,4	28	26,6
SC (*)	18,0	30	12
PR	0,3	2	1,7
TOTAL	19,7	60	40,3

(*) Abrangendo a pré-lavagem e o beneficiamento final no Lavador de Capivari S/A. ou outra unidade central de beneficiamento.

⑨

TRANSPORTE DE CARVÃO NO BRASIL

O transporte de carvão no Brasil está afeto ao Ministério dos Transportes que, baseado nas informações sobre produção e demanda de carvão energético, vem realizando estudos para a ampliação dos serviços necessários para o transporte do carvão nacional para substituir o consumo de óleo combustível importado. Tais estudos irão definir os Programas a serem executados e os investimentos necessários para tal fim.

Ferrovias

O transporte ferroviário de carvão vapor, devido à demanda anteriormente descrita, apresentará grande crescimento. Além do transporte tradicional do carvão, em Santa Catarina, a ferrovia deverá responder nos próximos anos por importantes volumes junto às minas no Rio Grande do Sul e, imediatamente, por fluxo crescente de carvão no Tronco Sul, destinado às fábricas de cimento do Paraná e São Paulo. Estes fatos exigem transformações expressivas na malha ferroviária, envolvendo os seguintes aspectos:

- ampliação da frota de vagões e locomotivas;
- modernização do Tronco Principal Sul;
- modernização e eletrificação da Divisão Operacional de Tubarão;
- construção de Ramais Ferroviários de Acesso às Minas.

Algumas atividades nesta área já vêm sendo executadas com recurso do orçamento de 1980, ao mesmo tempo que se define a Programação de 1981.

Navegação Interior e Cabotagem

Até o momento o transporte de carvão na cabotagem se limita, praticamente, ao carvão de Santa Catarina. A partir do último trimestre do ano passado acrescentou-se o carvão vapor ao transporte tradicional de carvão metalúrgico. Este último tipo de transporte vem experimentando um expressivo crescimento.

O carvão vapor movimentado no litoral, é marginal em relação ao total de carvão transportado. O seu transporte tem se realizado satisfatoriamente.

Existe atualmente uma frota de 11 graneleiros autorizados a operar no transporte de minério, na cabotagem, perfazendo um total de 211 mil toneladas de porte bruto, sendo que a grande maioria está voltada para a exclusiva movimentação do carvão. A essa frota, em decorrência do 2º Programa de Construção Naval, serão incorporados, até 1982, outros 5 graneleiros já contratados, em um total de mais 75.000 TPB.

Assim, a capacidade de transporte marítimo mostra-se suficiente para atender ao fluxo de carvão vapor e metalúrgico, anteriormente previsto, até 1983, inclusive. Em 1984 e 1985 estima-se uma forte inflexão na curva da demanda do carvão, havendo necessidade de se agregar de mais 220 mil toneladas de porte bruto à frota então atuante.

O Ministério dos Transportes, através da SUNAMAM, está ultimando os estudos do dimensionamento da frota graneleira para o carvão, visando a contratação da construção de novos navios na indústrial naval do País.

No caso da Navegação Interior, fluxos crescentes de transporte deverão ocorrer a partir das Minas do Baixo Jacuí em direção a Porto Alegre, Pelotas, Rio Grande e outros pequenos portos. Os fluxos transportados pela navegação interior deverão crescer de 1,1 milhão de toneladas, em 1981, para 5,2 milhões de toneladas em 1985.

O Ministério dos Transportes deu início a reuniões com os armadores para assegurar a expansão da capacidade de transporte para 500 mil toneladas de porte bruto, em 1985.

(12)

Portos

A movimentação do carvão para fora dos Estados produtores deverá fazer-se da seguinte forma:

- Santa Catarina - quase integralmente através da Cabotagem, utilizando-se para o escoamento o porto de Imbituba.
- Rio Grande do Sul - predominantemente através da cabotagem com uso da navegação interior na alimentação do porto, levando o carvão das minas do Baixo Jacuí principalmente para os portos de Porto Alegre, Pelotas e Rio Grande. Complementarmente será utilizada a ferrovia do Tronco Sul.

O recebimento do carvão, movimentado pela cabotagem, se dará nos portos de Antonina, Santos, Cosipa, Sepetiba, Rio de Janeiro, Vitória e Praia Mole. Não existe previsão do uso de carvão mineral no Nordeste. Em razão deste fato, igualmente não existem providências para a adequação dos portos da região.

Os portos expedidores são: Imbituba-SC, Porto Alegre, Pelotas e Rio Grande-RS e os portos recebedores são: Antonina-PR, Santos-SP, Rio de Janeiro e Sepetiba-RJ.

As providências do Setor de Transportes visam, em essência, assegurar em tempo próprio, a necessária infra-estrutura de transportes para o escoamento do carvão bem como evitar a formação de estrangulamentos que impeçam a plana realização dos Programas em execução pelos demais setores engajados no processo de exploração e comercialização do carvão nacional.

MG/mfn.

ENTREPOSTOS DE CARVÃO ENERGÉTICO

Introdução

Para atender à demanda de carvão aos diversos segmentos industriais, a CAEEB implantou uma infra-estrutura de comercialização e distribuição desse insumo, que se encontra em plena operação.

Em função da assinatura do Protocolo do Cimento, do crescimento do mercado e de outros segmentos emergentes, a CAEEB vem desenvolvendo um programa de implantação e interiorização de entrepostos, visando a um adequado sistema de fornecimento de carvão energético às regiões de consumo.

O programa de implantação de entrepostos ora em curso, conta com a participação de representantes de vários órgãos do Ministério dos Transportes (GEIPOT, RFFSA, AGEF, PORTOBRAS), do Conselho Nacional do Petróleo e dos Governos dos Estados produtores de carvão.

Entrepostos em Operação

Atualmente, são os seguintes os entrepostos em operação pela CAEEB:

RIO GRANDE DO SUL

Entreposto de CHARQUEADAS
Situado na boca da mina de CHARQUEADAS, possui uma capacidade de estocagem da ordem de 100.000 t/mês

e seu carvão é na maioria de 35% de cinzas, o qual é beneficiado pelo Lavador da Aços Finos Piratini S/A. Recebe, também, carvão da mina do RECREIO.

Abastece o setor cimenteiro gaúcho e outras pequenas indústrias.

Opera também como pólo de distribuição para entrepostos localizados em outros Estados.

- SANTA CATARINA

Entreposto de TUBARÃO

Situado próximo ao Lavador de Capivari S/A, com uma capacidade de operar até 4 milhões de toneladas. Recebe uma alimentação média mensal de 50.000 t/carvão vapor, proveniente do beneficiamento do carvão pré-lavado.

Abastece a fábrica de cimento existente no Estado, a qual futuramente será atendida pelo Entreposto de ITAJAÍ.

Outras indústrias são abastecidas neste Entreposto.

É distribuidor de carvão catarinense para Entrepostos de outros Estados.

- PARANÁ

Entreposto de ANTONINA

Localizado no porto de Antonina, possui uma capacidade de estocagem da ordem de 35.000 t/mês.

Abastece prioritariamente a 3 indústrias cimenteiras do Estado, com carvão catarinense de 35% de cinzas e outras indústrias com carvão de 40% de cinzas.

Entreposto do RIO GRANDE
Localizado em uma área a ser cedida pêla PORTOBRAS, no porto do RIO GRANDE, com uma capacidade de estocagem da ordem de 100.000 t/mês com carvões de 35% e 40% de cinzas.
Terá como finalidade abastecer as indústrias locais e servir de pólo de distribuição para Entrepostos em outros Estados.

Entreposto de PORTO ALEGRE
Localizado em área portuária da capital gaúcha, com capacidade de estocagem, aproximadamente, de 150.000 t/mês.
Sua principal finalidade será servir de pólo de distribuição, via tronco Sul.

- SANTA CATARINA

Entreposto de ITAJAÍ
Local em área a ser definida, terá uma capacidade de estocagem da ordem de 75.000 t/mês.

Abastecerá, prioritariamente, as indústrias de cimento e outros segmentos industrias, que representam, a curto prazo, um consumo já identificado de 50.000 t/mês.
Esse Entreposto, será abastecido pelo Entreposto de TUBARÃO.

- PARANÁ

Entreposto de BALSA NOVA
O terreno já foi selecionado e estão sendo realizadas gestões com vistas à sua aquisição ou ao seu arrendamento.
A área do mesmo é de aproximadamente 30.000 m².

A capacidade de estocagem prevista é de 70.000 t/mês e terá como finalidade principal abastecer as indústrias de cimento paranaenses, com carvão oriundo da bacia de JACUI-RS, através do Tronco-Sul.

- SÃO PAULO

Entreposto de SOROCABA
O terreno selecionado pertence ao Ministério da Agricultura (Fazenda IPANEMA) e localiza-se próximo a estação ferroviária de GEORGE OETERER, da FEPASA. A área a ser obtida deverá girar em torno de 100.000 m^2.
A capacidade de estocagem prevista é de 130.000 t/mês e abastecerá, principalmente, as indústrias de cimento paulistas com carvão gaúcho, escoado via Tronco-Sul.

- RIO DE JANEIRO

Entreposto de SEPETIBA
Estão sendo feitas gestões junto à PORTOBRAS para obtenção da área necessária à implantação deste Entreposto, no porto de SEPETIBA.
A capacidade de estocagem inicial prevista é de 100.000 t/mês e abastecerá as indústrias de cimento do Estado do Rio de Janeiro e de Minas Gerais. Futuramente, suprirá também a Companhia Estadual de Gás - CEG, em ITAGUAÍ - RJ.

- MINAS GERAIS

Entreposto de MATOZINHOS
O terreno já foi selecionado e estão sendo feitas gestões para a aquisição ou arrendamento da área escolhida, que tem cerca de 150.000 m^2.

A capacidade de estocagem prevista é de 140.000 t/mês e abastecerá as fábricas de cimento situadas em Minas Gerais, com carvão do Rio Grande do Sul e de Santa Catarina.
Inicialmente, o abastecimento deste Entreposto se fará pelo porto do Rio de Janeiro, enquanto não for possível através do porto de Vitória.
O entrave desta última alternativa, é o trecho Santa Bárbara/Costa Lacerda, devido à sua elevada densidade de tráfego.

ESPÍRITO SANTO

Entreposto de VITÓRIA
O porto de PAUL foi considerado favorável à instalação deste Entreposto, embora não apresente condições para uma implantação imediata. Entretanto, pode ser reservada a área adjacente ao atual terminal portuário da USIMINAS para a instalação em uma primeira etapa. Posteriormente, pode-se contar com a utilização dos equipamentos de descarga e manuseio de carvão do terminal existente, quando da mudança da USIMINAS para PRAIA MOLE.
A área a ser ocupada é de aproximadamente 40.000m^2.
Com capacidade de estocagem prevista de 150.000 t/mês, abastecerá a Cimento Itabira Agro-Industrial e funcionará no futuro como pulmão do Entreposto de MATOZINHO.

O custo total de investimentos para a implantação dos Entrepostos é apresentado em quadro anexo.

Os Entrepostos de BUTIÁ, RIO GRANDE e PORTO ALEGRE, todos no Rio Grande do Sul e ITAJAÍ - SC, não tiveram seus custos incluídos no quadro anexo, em virtude de os investimentos serem de menor monta e correrem à conta de projetos específicos para apresentação ao Conselho Nacional do Petroleo - CNP.

⑱

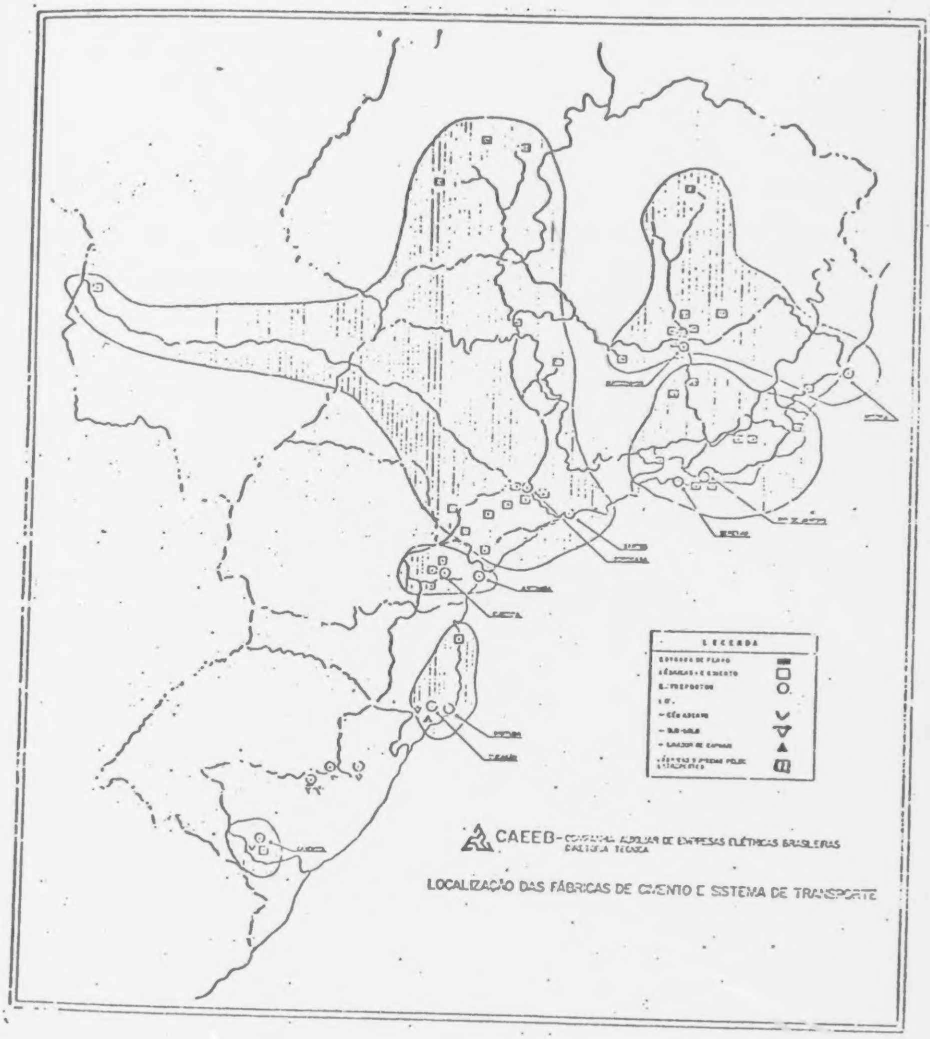
CAEEB

CUSTO TOTAL DE INVESTIMENTO (PREÇOS JULHO/80)

(CR$ 1.000,00)

ENTREPOSTO / ITEM ORÇAMENTÁRIO	BALSA NOVA-PR	SOROCABA SP	SANTOS SP	SEPETIBA RJ	VITÓRIA ES	MATOSINHOS MG	TOTAL POR ITEM
I - PROJETO							
I.1-Levantamento planialtimétrico, terraplenagem e drenagens	264	264	924	-	-	396	1.848
I.2-Obras Civis	449	449	2.904	132	449	449	4.832
I.3-Sistemas de Manuseio e Estocagem	264	264	1.320	-	1.320	396	3.564
SUBTOTAL (I)	977	977	5.148	132	1.769	1.241	10.244
II- AQUISIÇÃO DE EQUIPAMENTOS							
II.1 - Balanças	990	990	1.980	-	-	1.980	5.940
II.2 - Trator c/Lâmina e Pá Carregadeira	4.818	4.818	4.818	-	4.818	9.636	28.908
II.3 - Equipamentos Específicos	6.600	6.600	170.544	-	145.200	13.200	342.144
II.4 - Sistema de Iluminação	528	528	2.574	-	2.574	1.980	8.184
SUBTOTAL (II)	12.936	12.936	179.916	-	152.592	25.796	385.176
III-MONTAGEM E INSTALAÇÃO	1.940	1.940	12.012	-	10.692	2.039	28.623
SUBTOTAL (III)	1.940	1.940	12.012	-	10.692	2.039	28.623
IV - OBRAS CIVIS							
IV.1 - Terraplenagem	10.560	13.200	19.800	-	-	13.200	56.760
IV.2 - Edificações e Fundações de Balanças	2.112	2.112	8.580	660	6.600	3.168	23.232
IV.3 - Trilhos Assentados	-	-	14.520	-	13.200	-	27.720
SUBTOTAL (IV)	12.672	15.312	42.900	660	19.800	16.368	107.712
V - ADMINISTRAÇÃO							
V.1 - Engenharia	896	896	3.767	24	2.902	1.458	9.943
V.2 - Compras	259	259	3.598	-	3.052	536	7.704
V.3 - Fiscalização	2.898	2.898	5.312	5	5.312	2.898	19.323
V.4 - Inspeção	65	65	900	-	763	134	1.927
SUBTOTAL (V)	4.118	4.118	13.577	29	12.029	5.026	38.897
TOTAL	32.643	35.283	253.553	821	196.882	51.470	570.652

(19)



CAEEB - COMPANHIA AUXILIAR DE EMPRESAS ELÉTRICAS BRASILEIRAS
DIRETORIA TÉCNICA

LOCALIZAÇÃO DAS FÁBRICAS DE CIMENTO E SISTEMA DE TRANSPORTE

EVOLUÇÃO DA RELAÇÃO "PRODUÇÃO/CONSUMO" DE CARVÃO VAPOR

PERÍODO: 1976 até 1979

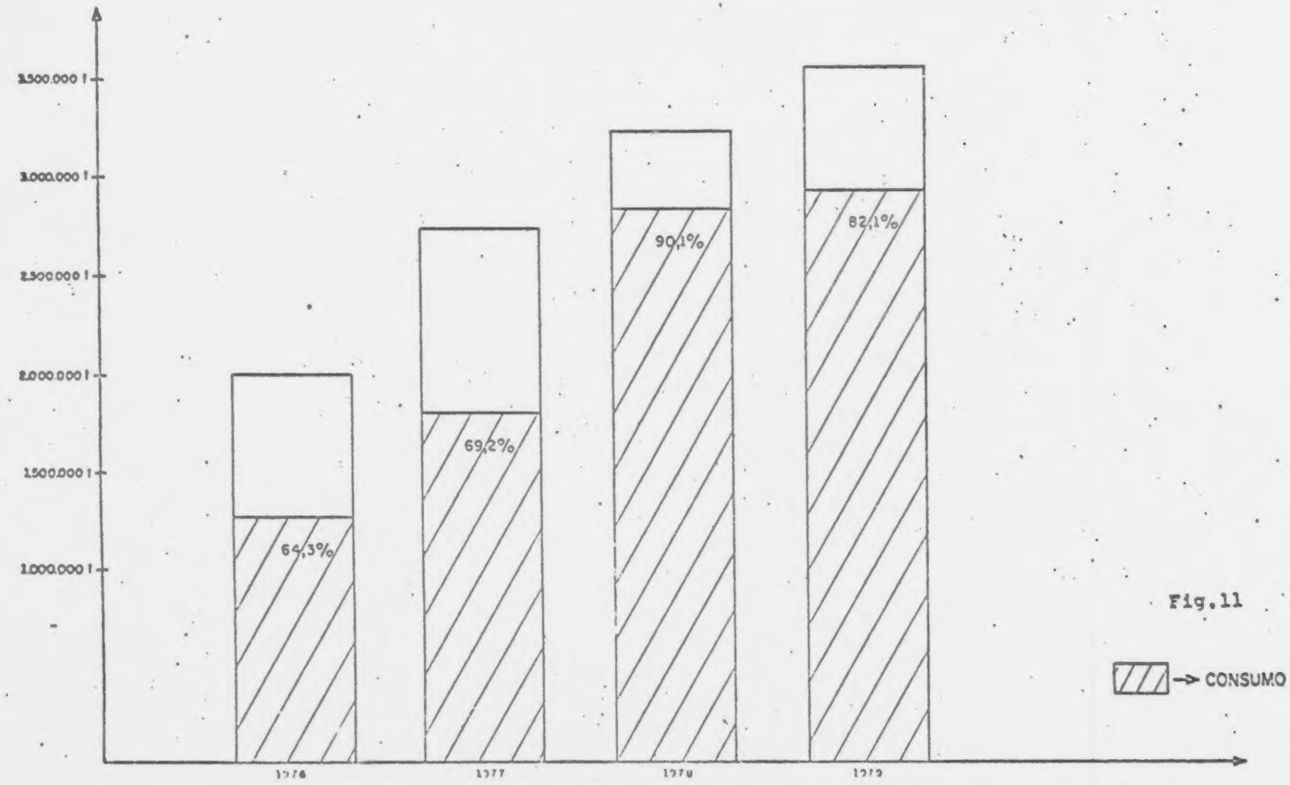
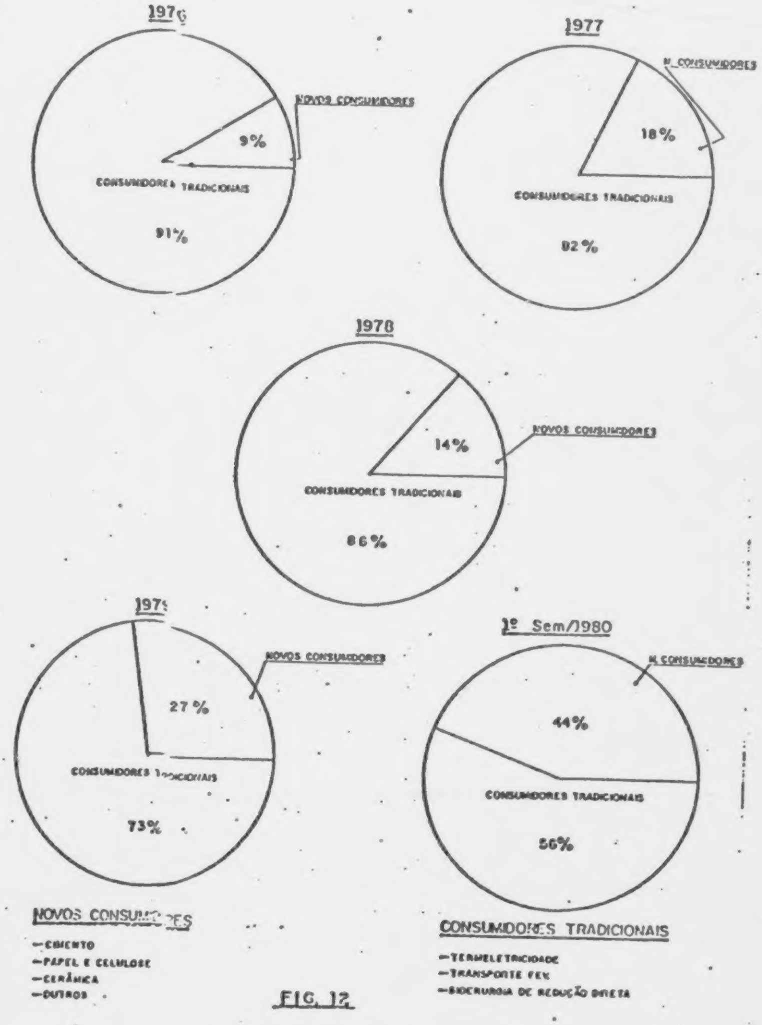


Fig.11

⑳

DESENVOLVIMENTO DA ESTRUTURA DE CONSUMO DO CARVÃO VAPOR

PERÍODO: 1976 até 1º SEMESTRE DE 1980



NOVOS CONSUMIDORES

- CIMENTO
- PAPEL E CELULOSE
- CERÂMICA
- OUTROS

CONSUMIDORES TRADICIONAIS

- TERMELETRICIDADE
- TRANSPORTE FER.
- SIDERURGIA DE REDUÇÃO DIRETA

FIG. 12

CAEEB - Mod. 028

(22)

ESTRUTURAS DE CONSUMO DE CARVÃO ENERGÉTICO DE 1976 a 1980

10³t

SETOR DE CONSUMO	1976	%	1977	%	1978	%	1979	%	1980*	%
Tradicional	1.358	91	1.583	84	2.639	87	2.236	75	1.063	56
termeletricidade	1.258		1.512		2.558		2.144		977	
transportes	26		32		39		38		23	
sid. redução direta	74		39		42		54		63	
Emergente	133	9	308	7	308	13	764	25	820	44
cimento	130		277		343		646		522	
outros	13		31		49		118		298	
Total	1.491	100	1.891	100	3.031		3.000	100	1.883	100

* Os valores desta tabela são aproximados, baseados em documentos de intenção e indicando, apenas, "ordem de grandeza".

PREVISÃO DE CONSUMO DE CARVÃO ENERGÉTICO POR SETOR 1981/1985

10³t

SETOR DE CONSUMO	1981	1982	1983	1984	1985
Termeletricidade	2.270	2.784	3.150	3.922	3.769
Transporte	45	57	72	77	84
Siderurgia	126	146	380	1.038	1.429
Cimento	2.338	3.790	4.437	4.862	5.186
Combustão	190	312	435	858	1.281
Papel e Celulose	180	420	444	528	528
Petroquímica	40	240	540	720	840
Gaseificação	-	1.220	1.613	2.898	7.228
Total	5.189	8.969	11.071	14.903	20.345

Figura 14

CAEEB ㉓

CARVÃO ENERGÉTICO COMPRADO - 1980 TONELADAS

TIPO	JAN a JUNHO	JULHO	AGOSTO	SETEMBRO	OUTUBRO	NOVEMBRO	DEZEMBRO
52/54% cz	238.285	190.284	196.168	95.728			
40/42% cz	623.744	134.880	133.496	108.883			
38% cz	227.145	22.465	58.860	30.088			
35% cz	220.846	133.625	132.914	95.910			
34/32% cz	27.820	10.400	8.718	8.426			
20% cz	103.820	17.044	34.416	16.021			
TOTAL	1.441.660 240.276	508.698	444.952	355.056			

CAEEB (24)

CARVÃO ENERGÉTICO VENDIDO - 1980 TONELADAS

SEGMENTO INDUSTRIAL	TIPO CZ	JAN à JUNHO	JULHO	AGOSTO	SETEMBRO	OUTUBRO	NOVEMBRO	DEZEMBRO
ENERGIA ELÉ.	40	337.715	67.457	75.102	79.133			
	34	42.816	6.390	5.890	6.196			
	52	198.356	43.899	44.888	43.082			
	54	181.242	30.099	30.207	30.397			
	38	26.000	6.500	6.500	6.500			
	20	31.315	5.273	4.984	4.423			
		817.444	159.618	167.571	169.731			
CIMENTO	35	149.639	154.576	148.372	100.310			
	40	196.172	2.986	-	-			
	38	69.685	15.023	15.079	13.455			
		415.496	172.585	163.451	113.765			
OUTROS	34	30.015	12.534	17.474	3.890			
	38	56.908	19.870	17.024	11.646			
	40	140.680	67.338	59.542	8.741			
	20	71.906	23.540	24.446	11.596			
	54	28.368	11.144	12.989	12.249			
		327.877	134.426	131.475	48.122			
		1.560.817 260.136	466.629	462.497	331.618			

ESTOQUE DE CARVÃO ENERGÉTICO - 1980

Toneladas

TIPO	JAN a JUNHO	JULHO	AGOSTO	SETEMBRO
40% cz	2.318.059	2.368.310	2.414.957	2.436.610
38% cz	3.934	-	-	-
35% cz	279.935	261.800	251.056	238.546
52% cz	10.000	20.000	30.000	40.000
TOTAL	2.611.928	2.650.110	2.696.013	2.728.905

VIGÊNCIA
a partir de
10/07/80

CONSELHO NACIONAL DO PETRÓLEO

COMPANHIA AUXILIAR DE EMPRESAS ELÉTRICAS BRASILEIRAS

COMERCIALIZAÇÃO DO CARVÃO DE PRODUÇÃO NACIONAL NÃO APLICÁVEL NA PRODUÇÃO DE COQUE

ESTADO PRODUTOR	EMPRESA PRODUTORA	TIPO DE CARVÃO MINA	PC APROXIMADO kcal/kg	PREÇO VIGENTE DE VENDA DO PRODUTOR		PREÇO DE COMERCIALIZAÇÃO		ÔNUS DO CNP		OBSERVAÇ
				ATO	Cr$/t	ATO	Cr$/t	Cr$/t	%	
R.G. SUL	CRM	BRUTO (CANDIOTA)	3.200	Portaria CNP nº PC-06/80, de 09 / 07 /80, com vigência a partir de 01 / 07 /80.	268,37	Portaria CNP nº PC- 07/80, de 09 / 07 /80, com vigência a partir de 01 / 07 /80.	134,18	134,19	50,0	Preço base de come
		GRAUDO (LEÃO)	4.400		1.484,72		742,36	742,36	50,0	
		CV 35 (5)	4.500		1.961,30		916,78	1.044,52	53,3	FOB Mina Leão
	COPELMI	TECH (CHARQUEADAS)(1)	3.100		1.006,22		503,11	503,11	50,0	
		CV 40 (RECREIO)(2)	4.400		1.312,66		656,33	656,33	50,0	
		CV 35 (5)	4.500		1.709,19		916,78	792,41	46,4	FOB Charqueadas
S.CATARINA	GRUPOS A + B	VAPOR SECUNDÁRIO (SOTELCA) (3)	4.500		1.461,76 + 124,73 (4) 1.586,49		730,88 + 62,36 793,24	793,25	50,0	Frete Mina-Capivar 40% de cinzas
		CV 35 (GRUPO B) (5)	5.200		1.865,57 (6)		916,78	939,79	50,4	FOB Tubarão
			5.500		1.937,31		968,65	968,66	50,0	34% de cinzas
PARANÁ	CAMBUÍ	BRUTO			815,48					
		GROSSO (FIGUEIRA)	6.000		1.331,93		655,96	665,97	50,0	
		FINO (FIGUEIRA)	6.000		1.202,44		601,22	601,22	50,0	

CAEEB ㉖

Aspectos Institucionais

Quanto aos aspectos institucionais, devemos observá-los através de 3 (três) enfoques correlacionados, a saber:

1º) Área de competência de diferentes Ministérios.

2º) Responsabilidades desagregadas por Órgãos do M.M.E.

3º) Instrumentos Normativos.

O primeiro propõe-se a atribuir ao M.M.E. a tarefa de coordenar as ações relativas a pesquisa, produção, transformação e comercialização do carvão.

Cabendo ao Ministério dos Transportes a responsabilidade de proporcionar os meios necessários ao deslocamento do carvão, desde as fontes produtoras até aos entrepostos de distribuição do referido energético, ficando o Ministério da Indústria e Comércio com a incumbência de apoiar as indústrias no que diz respeito às transformações tecnológicas necessárias ao consumo.

O segundo enfoque é esquematizado na figura 10 .

Por fim, o terceiro enfoque fundamenta-se basicamente em dois instrumentos legais, a saber:

- Convênio CNP/CAEEB:
  celebrado em 19/11/1975, pelo qual a CAEEB foi introduzida no cenário do ciclo econômico do carvão, como executora de política de subsídios aos preços deste combustível (considerada, na época, como estratégia mais adequada para incentivar o consumo industrial);

- Portaria MME nº 2520:
  baixada em 20/12/1979, conferindo à CAEEB, entre outros órgãos da área ministerial, atribuições adicionais às que já tinha em função do Convênio acima, tendo em vista o programa de substituição de derivados do petróleo pelo carvão mineral de origem nacional.

Recursos Financeiros

Quatro fontes de recursos deverão proporcionar os meios necessários à concretização dos objetivos aqui expostos, conforme indica a figura 2 .

Vale observar que para efeito de se materializar a fonte considerada no item 4 da referida figura, é indispensável que o preço de venda do carvão acoberte o custo de todos os fatores de produção, incluindo-se portanto uma remuneração compatível do capital, efetivamente aplicado.

A título ilustrativo, exibimos os preços atualmente em vigor, corrigíveis semestralmente em janeiro e julho dos anos subseqüentes.

Vale relembrar que a tendência futura será a busca do preço real, isto é, o subsídio deverá ser gradualmente extinto. Porém, de acordo com norma vigente a retirada do subsídio dar-se-á sempre após a mesma medida se verificar no preço do óleo combustível, mantendo-se a relação dos preços de forma a que a do carvão não ultrapasse o nível de 70% do preço do óleo combustível.

Conclusão

A luz do exposto restam derradeiras palavras no intuito de melhor transmitir a filosofia de atuação do Governo.

Tudo se assenta num tripé, perfeitamente inteligível, a saber:

1º) Autonomia energética.
2º) Autonomia tecnológica.
3º) Apoio a iniciativa privada.

Para lograr-se a consolidação desse tripé é fundamental que ocorra uma perfeita interação entre os agentes, públicos e privados. Portanto, se o Governo se propõe a fornecer, através de logística própria, física e financeira, além de preços administrados corretos, é lúcido supor o total engajamento do setor privado nacional.
Enfim, trata-se de uma ação concertada entre o Governo e Empresas do setor privado.

(29)

RECURSOS

1. PROGRAMA DE MOBILIZAÇÃO ENERGÉTICA

   DECRETO-LEI Nº 1691, DE 02.08.1979
   DECRETO-LEI Nº 1785, DE 13.05.1980

2. RECURSOS DE FINANCIAMENTOS DE BANCOS OFICIAIS

   BNDE
   BB

3. RECURSOS DE FINANCIAMENTOS EXTERNOS

   P. E. POLÔNIA, FRANÇA
   ORGANIZAÇÕES REGIONAIS

4. RECURSOS PRÓPRIOS DOS EXECUTORES DOS PROJETOS

Fig. 2

British Embassy
3100 Massachusetts Avenue NW Washington DC 20008
Telex Domestic USA 89-2370/89-2384
Telex International 64224(WUI)/248308(RCA)/440015(ITT)
Telephone (202) 462-1340

13 hrs.

462-0139

Mr Roger Sindelar
Senate Subcommittee on Energy and
Mineral Resources
Room 3204 Senate Dirksen Bldg
Washington D.C.

Your reference
Our reference M/2
Date 13 November 1981

Dear Mr Sindelar,

Please refer to our telephone conversation today. As explained, our government will not be sending any representative to Washington to appear at the hearing to be held by your Subcommittee on 1 December or putting in a written submission. We have however informed the two power companies, which are the two major coal users in Hong Kong, of the hearing and asked them to make their own arrangements if they wish to send representatives or put in a written submission. For your information, the names and addresses of the two power companies are as follows:-

(a) The Hong Kong Electric Co. Ltd
44 Kennedy Road
Hong Kong

(b) China Light and Power Co. Ltd
147 Argyle Street
Kowloon
Hong Kong

2. For your background information, I have enclosed some statistics on Hong Kong's imports and retained imports of coal. You will note that, according to the Hong Kong Trade Statistics, USA is an insignificant supplier of coal to the local market. No imports from USA in the years 1970 to 1977. Imports from USA in the years 1978,1979,1980 and 1981 (January-August) amounted to 28, 2, 10 and 3 metric tons respectively. Furthermore, the proportion of coal to fuel oil to be used by these two companies for the next five years is as follows:-

	1982	1983	1984	1985	1986
HK Electric	100:200	100:30	100:19	100:18	100:29
China Light	100:1 390	100:410	100:200	100:140	100:100

3. I hope you find the above information useful.

Yours sincerely,

Y.Y.P. Choi
First Secretary
Hong Kong Office

Wo Ant Cok Othe

Table 1

Quantity of imports & re-exports of coal and charcoal by principal source and destination, 1978

(Metric ton)

Type of Product	Imports							Re-exports				Retained Imports
	Total	By Source						Total	By destination			
		West Malaysia	China	Vietnam	Japan	Singapore	Others		Macau	China	Others	
Wood charcoal	18 998	14 425 (76)	154 (1)	-	860 (5)	2 676 (14)	883 (4)	1 226	1 167 (95)	-	59 (5)	17 772
Anthracite	5 529	-	1 450 (26)	4 050 (73)	1 (*)	-	28 (1)	5	5 (100)	-	-	5 524
Coke & Semi-coke	5 897	-	-	-	4 998 (85)	70 (1)	829 (14)	14	14 (100)	-	-	5 883
Other coal	2 182	-	2 182 (100)	-	-	-	-	20	-	-	20 (100)	2 162
Total	32 606	14 425 (44)	3 786 (12)	4 050 (12)	5 859 (18)	2 746 (8)	1 740 (6)	1 265	1 186 (94)	-	79 (6)	31 341

Figures in brackets denote percentage shares against the corresponding total *percentage share of less than 0.5%

Source : Hong Kong Trade Statistics

Table 2

Quantity of imports and re-exports of coal and charcoal by principal source and destination, 1979

(metric ton)

Type of product	Imports							Re-exports				Retained imports
	Total	By source						Total	By destination			
		West Malaysia	China	Vietnam	Japan	Singapore	Others		Macau	China	Others	
Wood charcoal	21 087	14 705 (70)	670 (3)	-	-	4 487 (21)	1 225 (6)	1 453	1 451 (100)	-	2 (*)	19 634
Anthracite	5 305	-	2 346 (44)	2 957 (56)	-	-	2 (*)	-	-	-	-	5 305
Coke & Semi-coke	6 749	-	-	-	5 939 (88)	-	810 (12)	3	3 (100)	-	-	6 746
Other coal	509	-	509 (100)	-	-	-	-	-	-	-	-	509
Total	33 650	14 705 (44)	3 525 (10)	2 957 (9)	5 939 (18)	4 487 (13)	2 037 (6)	1 456	1 454 (100)	-	2 (*)	32 194

Figures in brackets denote percentage shares against the corresponding total

* percentage share of less than 0.5%

Source : Hong Kong Trade Statistics

Table 3

Quantity of imports and re-exports of coal and charcoal by principal source and destination, 1980

(metric ton)

Type of product	Imports							Re-exports				Retained imports
	Total	By source						Total	By destination			
		West Malaysia	China	Vietnam	Japan	Singapore	Others		Macau	China	Others	
Wood charcoal	22 830	11 077 (48)	989 (4)	-	-	8 130 (36)	2 634 (12)	1 424	1 423 (100)	-	1 (*)	21 406
Anthracite	2 095	-	698 (33)	1 000 (48)	387 (18)	-	10 (1)	100	100 (100)	-	-	1 995
Coke and semi-coke	5 571	-	-	-	4 646 (83)	-	925 (17)	10	-	10 (100)	-	5 561
Other coal	756	-	747 (99)	-	-	-	9 (1)	-	-	-	-	756
Total	31 252	11 077 (35)	2 434 (8)	1 000 (3)	5 033 (16)	8 130 (26)	3 578 (12)	1 534	1 523 (99)	10 (1)	1 (*)	29 718

Figures in brackets denote percentage shares against the corresponding total.

* percentage share of less than 0.5%

Source : Hong Kong Trade Statistics

Table 4

Quantity of imports & ~~re-exports~~ of coal and charcoal by principal source and destination 1981 (Jan - Aug.)

(Metric ton)

Type of Product	Imports							Re-exports				Retained imports
	Total	By Source						Total	By destination			
		West Malaysia	China	Vietnam	Japan	Singapore	Others		Macau	China	Others	
Wood charcoal	15 508	4 748 (31)	574 (4)	-	-	8 344 (54)	1 842 (11)	1 148	1 136 (99)	-	12 (1)	14 360
Anthracite	5 038	-	443 (9)	3 200 (64)	-	-	1 395 (27)	4	-	-	4 (100)	5 034
Coke & semi-coke	2 980	-	704 (24)	-	1 918 (64)	-	358 (12)	-	-	-	-	2 980
Other coal	-	-	-	-	-	-	-	-	-	-	-	-
Total	23 526	4 748 (20)	1 721 (7)	3 200 (14)	1 918 (8)	8 344 (35)	3 595 (16)	1 152	1 136 (99)	-	16 (1)	22 374

Figures in brackets denote percentage shares against the corresponding total
* percentage share of less than 0.5%

Source : Hong Kong Trade Statistics

Table 5

Quantity of retained imports of coal and charcoal 1970–1981(Jan.-Aug.)

(metric. ton)

Type of product	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	(Jan-Aug)1981
Wood charcoal	24 393	23 294	16 886	17 181	16 321	9 378	14 966	16 924	17 772	19 634	21 406	14 360
Anthracite	23 002	29 648	20 777	11 559	10 797	9 569	12 969	11 109	5 524	5 305	1 995	5 034
Coke and semi-coke	8 022	8 002	5 674	3 648	4 938	4 431	6 548	5 044	5 803	6 746	5 561	2 950
Other coal	-	-	-	15	-	-	-	-	2 162	509	756	-
Total	55 417	61 744 (+11)	43 337 (-30)	32 403 (-25)	32 056 (- 1)	23 379 (-27)	34 483 (+48)	33 077 (- 4)	31 341 (- 5)	32 194 (+ 3)	29 718 (- 8)	22 374 (+11)

Figures in brackets denote percentage change over the corresponding period

Source : Hong Kong Trade Statistics

Table 6

Average unit values of imports of coal and charcoal, 1970-1981(Jan-Aug)

(HK$ per kilogram)

Type of product	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981(Jan-Aug)
Wood charcoal	0.243	0.234	0.229	0.273	0.376	0.343	0.432	0.438	0.643	0.843	0.918	0.801
Anthracite	0.103	0.109	0.108	0.134	0.158	0.176	0.191	0.218	0.260	0.302	0.445	0.540
Coke and semi-coke	0.270	0.340	0.344	0.330	0.557	0.711	0.786	0.808	0.856	0.934	1.018	1.162

Source : Hong Kong Trade Statistics

Washington, November 13, 1981

1981 DEC -3 PM 4 15

The Honorable
Senator John W. Warner
Chairman
Subcommittee on Energy and
Mineral Resources
Washington, DC 20510

Dear Senator Warner:

Thank you for your letter dated October 24, 1981, in which you extended an invitation to representatives of the Brazilian Government and coal buyers and users to testify on Brazilian coal programs before the Subcommittee on Energy and Mineral Resources of the United States Senate at its December 1st hearing concerning "America's role in the World Coal Export Market". You suggested also that if the appropriate representatives are unable to appear in person before the Subcommittee, a written statement be submitted for the record.

2. In reply, I am enclosing information which provide an overview of the Brazilian coal situation and its prospects.

Sincerely,

Antonio F. Azeredo da Silveira
Ambassador

MINERAL COAL

Mineral coal has represented only a small fraction of the total energy used in Brazil. This fraction - about 4% - has remained constant for the last ten years. Brazilian coal, because of its characteristics, has had limited use in the steel industry. However, it has now come to represent an important alternative as a substitute for fuel oil in the generation of industrial heat.

2. In 1978 coal consumption in Brazil showed the following breakdown by sectors:

- 3.3 million tpe (*), steel refining
- 1.3 million tpe, industrial heat
- 0.1 million tpe, other uses.

3. Sixty percent of this coal is imported; and the bulk of coal imports is used in the steel industry. Yet a gradual change in the structure of the production of coal is taking place during this decade. Mineral coal tends to represent a larger share of Brazil's overall energy consumption; this share should reach at least 6% by the mid 80s.

4. This change will result from incentives now being granted for the substitution of coal for oil by-products, particularly fuel oil, in thermoelectric powerplants and steelworks, as well as in the following industries: cement, nonferrous metals, ceramics, glass, paper and cellulose, food and beverages, petrochemicals, oil refining, rail and shipping. Agreements have been signed between Government agencies and most of these industries to implement the policy of substituting coal for fuel oil. As estimated by the Executive branch, such substitution

(*) 1 tpe (tons of petroleum equivalent)= $12.4X10^9$)

should obviate 29% of total fuel oil demand by 1985.

CONSUMPTION

5. Coal consumption during 1969/79 showed a 8.1% annual growth, with 6.5% for domestic production and 9.3% for imported coal. The growth in steam coal consumption after 1974, it should be stressed is a result of the Government policy to market steam coal at subsidized prices and the creation of a marketing infrastructure through redistribution centers with equalized prices. Steam coal consumption, so far almost exclusively dedicated to thermo-electricity and railroad locomatives, has been extended to other non-traditional consumers.

YEAR	DOMESTIC(1,000 t)										
	METALLURGICAL	STEAM	REDUCER	COKE	TOTAL	METAL-1	COKE	TOTAL	DOMESTIC (*)	IMPORTED	TOTAL
1969	767	1,576	-	-	2,343	1,649	89	1,738	1,073	1,269	2,342
1970	747	1,564	-	-	2,311	1,728	105	1,833	1,053	1,338	2,391
1979	1,233	3,000	54	127	4,414	3,924	328	4,252	2,025	3,098	5,123
1980	1,300	4,239	126	200	5,865	4,400	600	5,000	2,695	3,631	6,326

** estimated

Consumption forecast

6. Consumption forecasts for the steel industry based on data provided by the Ministry of Industry and Commerce reflect the programmed evolution of the country's metallurgical industry. Steam coal consumption forecasts indicate a higher

annual growth rate (36.5%) than in previous balance sheets, taking into account many new consumers who had previously been using petroleum products. This increase in consumption is due to agreements between the Government and the industrial sector, calling for the use of coal instead of fuel oil. Two protocols already signed with the cement and steel industries deserve attention here. Other protocols are now under discussion and their results will eventually increase projected consumption. Included in the coal consumption forecast are State Programs proposed to substitute coal for fuel oil.

	DOMESTIC (1.000t)					IMPORTED (1,000)			1,000tpe(*)		
YEAR	STEEL INDUSTRY (1) (2)	STEAM (2)	REDUCER (3)	COKE (4)	TOTAL	STEEL INDUSTRY (1) (2)	COKE (4)	TOTAL	DOMESTIC	IMPORTED	TOT
1981	1,455	5,075	126	250	6,906	4,500	610	5,110	3,162	3,711	6,87
1982	1,800	8,845	126	290	11,061	7,500	730	8,230	4,829	5,991	10,82
1983	2,100	10,931	142	320	13,493	9,700	1,000	10,700	5,837	7,786	13,62
1984	2,500	14,668	238	350	17,756	9,900	1,050	10,950	7,454	7,967	15,42
1985	2,500	20,102	255	380	23,226	9,800	1,150	10,950	9,758	7,961	17,71

Sources: (1) SIDEBRÁS
(2) CAEEB
(3) CONSIDER
(4) CNP
(*) Conversion coefficient variable

PRODUCTION

7. Before 1975, steam coal production was primarily intended for the production of thermoelectricity. That year, the Ministry of Mines and Energy established a policy of marketing coal at subsidized prices, among other actions, as a way of encouraging its use in other industrial sectors for the purpose of reducing dependence on petroleum products. Fuel coal production in Rio Grande do Sul and Paraná matches demand, while fuel production in Santa Catarina is a by product of metallurgical coal production. Thus, as the Santa Catarina thermoelectric sector failed to absorb the entire production of steam coal, stocks began to build up at the mines. In recent years, however, the situation has started to change; cement, steel and pulp industries as well as gasification plants and others now, represent a new market for steam coal.

(1,000t)

YEAR	STEEL INDUSTRY	STEAM	REDUCER	COKE	TOTAL
1969	811	1,626	-	-	2,437
1970	785	1,576	-	-	2,361
1971	820	1,678	-	7	2,505
1972	809	1,688	-	20	2,517
1973	785	1,464	50	28	2,327
1974	1,071	2.075	64	46	3,256
1975	804	1,829	84	45	2,762
1976	865	2,389	76	72	3,402
1977	1,049	2,810	49	79	3,987
1978	1,130	3,265	43	88	4,526
1979	1,223	3,590	74	119	5,006
1980	1,300	23,477	126	200	5,063

Sources: CNP - Consider

PRODUCTION FORECAST

8. The anticipated increase in production in the next few years will depend on an intensive joint effort in coal mining, processing, transportation and distribution. The several mining projects submitted provide for the activation of mines with idle capacity, the installation of new underground and open pit mines and a continuing effort in research and mineral exploration.

YEAR	STEEL INDUSTRY (1)	STEAM (2)	REDUCER (3)	COKE (4)	TOTAL
1981	1,455	5,232	126	250	7,063
1982	1,800	7,169	126	290	9,385
1983	2,100	10,126	142	320	12,688
1984	2,500	17,097	238	350	20,185
1985	2,500	23,477	244	380	26,601

Sources: (1) SIDREBRÁS
(2) CAEEB
(3) CONSIDER
(4) CNP

THE WALL STREET JOURNAL

11-3-81

Four Mining Firms Win Coal Contracts From Indonesians

p39

Special to THE WALL STREET JOURNAL

JAKARTA—Indonesia awarded four international mining companies coal-development concessions to open vast coal fields in southeastern Kalimantan, the first coal-development rights Indonesia has granted foreign mining companies since 1973.

N.P. Tambang Batubara, Indonesia's state-owned coal company, signed the largest of the contracts with P.T. Arutmin Indonesia, a joint venture of Atlantic Richfield Co., Los Angeles, and Utah International Inc., a unit of General Electric Co. of Fairfield, Conn. The contract gives Arutmin the right to survey, explore and mine a 4,863-square mile area of Kalimantan near Banjarmasin.

Batubara signed a similar agreement with P.T. Utah Indonesia, a subsidiary of Utah International, for a 3,088-square mile area in east Kalimantan. A third contract with a still unincorporated 50-50 joint venture between Agip Overseas Ltd. of Italy and the Indonesian unit of Consolidated Coal Co., a unit of Du Pont Co. of Wilmington, Del., covers two concessions for coal in a 935-square mile tract in northeast Kalimantan near Sabah, Malaysia, and a 2,049-square mile area of east central Kalimantan near Samarinda.

THE JOURNAL OF COMMERCE, Tuesday, December 1, 1981

Brazil Preparing New Terminals To Handle Growing Coal Imports

By JAMES BRUCE
Journal of Commerce Special

SAO PAULO — By the time U.S. coal exporters are ready with expanded facilities at such ports as Hampton Roads and other bottlenecks, specialized Brazilian terminals will be waiting here to receive their shipments.

An ambitious Brazilian plan to ease part of its dependence is behind schedule due to lack of adequate financing. However, a parallel port improvement plan is well under way to help move domestic coal from mining states to industrial consumers and to receive the imported coal that must be mixed with it.

Ironically, increased production and use of Brazil's considerable domestic coal reserves (current estimate more tham 10 billion tons) also means increased imports. That is because the low quality of Brazilian coal — average 42 percent ash content and 4,500 kilo calories per kilogram (4,500 kilcalories per kilogram) energy value — requires that it be mixed 30 percent with higher quality coal, to be used in steel mill blast furnaces.

However, the military government, conscious of "national security," considers importing quality coal to mix with its own lower grade product to be a way of diversifying sources of imported energy.

Brazil imported about 4.5 million tons of coking coal in 1980, a figure which the country's burgeoning steel industry could push to six million tons by 1985. Supply sources currently favor the United States (about 60 percent), plus Poland (27 percent before recent supply problems), Canada (10.5 percent), and Australia (2.5 percent). Additional imports are being negotiated with Colombia. China and Poland, and Brazil is considering cooperation with Spain to develop coal deposits in Colombia.

At home, the national coal program (Procarvao) calls for a six-fold increase in domestic coal output to 27 million tons between 1980 and 1985. Responding to sharply increasing demand, coal production in 1980 rose to three million tons, almost twice the 1979 figure, but an accute shortage of new investment capital has slowed Procarvao. Output this year will not reach the targeted 5.7 million tons, and the plans overral goal will be at least a few more years in coming.

Nevertheless, much of the associated US$153 million coal ports improvement program will be completed by next year, and will be complemented by another US$500 million invested through 1985 in railway improvements for coal transport.

The port plan include expanding coal supply terminals and coal handling installations at major ports in the southernmost coal producing states of Rio Grande do Sul, Santa Catarina and Parana.

The biggest of these, Imbituba, which will tranship coal from mines in Rio Grande do Sul and Santa Catarina to ports in consumer states to the north, will be able to move 16.2 million tons per year of Brazilian coal when completed in 1985. Its recently-finished first phase expansion boosted capacity to 3.5 million tons per year and a second phase now under way will increase that to 6 million tons per year. Other domestic coal supply terminals are being built or expanded at the ports of Rio Grande and Porto Alegra.

Further north along the Brazilian coast, two coal terminals for receiving and distributing domestic coal already are operating at Santos and Tubarao. Others are being built at Antonina, Paranagua, Sorocaba, Sepetiba, Vitoria, Salvador and Cebedelo.

The jewel on this chain of new coal terminals is that at Sepetiba Bay, scheduled to be inaugurated early next year.

Located 60 kilometers west of Rio de Janeiro, Sepetiba will receive imported coal for the Rio de Janeiro industrial park and the Volta Redonda steel mills nearby as well as for rail shipment to steel mills in the states of Minas Gerais and Sao Paulo. It will also be the terminal for the new Steel Railway, currently under construction and designed to distribute coal inland and to increase iron ore shipments from traditional Minas Gerais for local processing and for export.

Sepetiba's first phase will handle 5.8 million tons per year of imported coking coal and 130,000 tons per year of alumina to be brought in for processing by the new Valesul amuninum plant being built nearby. It eventually will also be able to service ships carrying 18 million tons per year of exported iron ore and 4 million tons per year of steel products — with ample capacity to carry plenty of coking on the return trips.

> *Brazil imported about 4.5 million tons of coking coal in 1980, a figure which the country's burgeoning steel industry could push to 6 million tons by 1985.*

Mainichi Daily News
Sunday, October 11, 1981

World Steam Coal Trade To Increase Enormously

MANILA (AFP-Jiji)—World steam coal trade is expected to increase 10 to 15 times by the year 2000 and will be dominated by Australia, Southern Africa, China, the United States and Canada, an official of Shell Coal International Ltd. (SCIL) said Friday.

SCIL Managing Director G.F. Pecchioli said the increased trade would be the result of coal's rediscovery as a more reliable energy source "capable of supplying economically an increasing proportion of future needs."

Pecchioli made his projections on the basis of what he called "growing political commitment" to double current coal production by 1990 to enable countries to face energy problems in the next two decades with "much greater confidence."

His projections which also cited an emerging competitive international coal market were presented before a session at the ongoing council of petroleum conference and exhibition (ASCOPE) here by the Association of Southeast Asian Nations (ASEAN).

Pecchioli said the growing importance of world coal trading would be based on its price which is not only cheaper but also more secure than that of oil because it is primarily determined by market conditions.

According to him, the increased coal trade would be made by its increasing penetration of new markets, particularly its competitive role as a fuel in the industrial market.

Among the industrial sectors he cited which could utilize more coal would be the iron and steel industry, the cement industry, coal firing industries, transportation and others.

"The delivered cost of coal to many industrial markets compared to alternative fuel sources is such that in may cases coal is now the most economic fuel option for the development of process heat facilities when a new plant has to be constructed," Pecchioli said.

"As the price of alternative fuels increase in comparison with coal, so the conversion of existing facilities to coal will also become increasingly attractive from an economic viewpoint," he added.

The Journal of Commerce 11-30-81

Ansaldo Proposes Indian Coal Project

By TREVOR DRIBERG
Journal of Commerce Special

23B

NEW DELHI, India — The Italian multinational, Ansaldo, has proposed to India the building of an integrated coal project involving the production of five million metric tons of coal yearly, a beneficiation plant and a [illegible]-megawatt power station.

Ansaldo will buy back two million tons of coal a year after beneficiation (the cleaning and upgrading of coal prior to combustion) as return for its investment in the project.

Ansaldo's investment mainly will be in the form of equipment for the power station. Ansaldo will also procure mining and beneficiation equipment from other countries or join hands with Indian engineering companies to provide it.

In another development, India and France soon will enter into a long-term agreement for the systematic transfer of French technology to India for exploiting thick-seam underground coal resources. Feasibility studies by the Indian government's coal mining planning and development institute have concluded that production can be raised at least 25 percent by adopting this method of mining.

Rough estimates indicate there is a minimum two billion tons of coal in deep underground mines which stand on pillars and cannot be mined effectively by other methods. Adoption of the French method is expected to increase production from these mines substantially at a marginal cost.

Besides France and Italy, India has formal pacts with Britain and the Soviet Union on technical aid to develop its coal industry.

India will have to import about 25 million tons of steam coal in the sixth five-year plan according to the World Bank. The bank takes the view that production of coal cannot go beyond 150 million to 155 million tons when the plan ends in March 1985 because of financial constraints, big slippages in commissioning projects, and shortage of inputs like explosives and construction materials.

The bank says there will be a large gap between the demand for coal and its availability, with demand ranging from 175 to 180 million tons.

The bank recommends that India examine the possibility of rationing coal to ensure equitable distribution to vital economic sectors like power, steel, cement and railways.

The bank advises government that the price of coal should be based on "export price parity, taking into account various financial, social, political and government objectives."

Besides expected shortages of steam coal, the integrated steel plants under Steel Authority of India Ltd. are facing an acute shortage of imported coking coal, thus compelling them to consume more domestic liftings. Indeed, they have no imported coal at all, informed sources report.

The Journal of Commerce

10-30-81

Occidental, ENI Create New Company

United Press International 22B

Occidental Petroleum and the Italian energy company Ente Nazionale Idrocarburi signed a $1 billion agreement creating a joint venture company for production and international sales of chemicals and coal.

The agreement creating the new company, known as Enoxy, was signed by Occidental chairman Armand Hammer and Alberto Grandi, chairman of ENI.

Initially, Enoxy's chemical subsidiary will operate 60 chemical plants in Italy formerly run by ENI's SIR and ANIC groups, according to the agreement. The joint venture's coal subsidiary, Enoxy Coal Inc., includes four coal mines in the United States.

"This agreement heralds a new era of international industrial cooperation," Mr. Hammer said at the signing ceremony.

"I believe that such associations are the wave of the future and that Enoxy will set an example of success for others to follow," Mr. Hammer said.

Synfuels Corp. Approves $18 Million Budget for '82

United Press International 22B

WASHINGTON — The new board of the $12 billion U.S. Synthetic Fuels Corp. at its first official meeting this week approved an $18 million operating budget for 1982.

One hundred and fifty persons showed up for the meeting in nearby Arlington, Va., after a Capitol swearing-in ceremony for the board that reflected the corporation's shrinking importance.

Overflow crowds studded with numerous high government officials used to turn out for meetings of the old board, appointed by President Carter, at a time when Congress seemed inclined to pour $88 billion into the corporation.

The corporation's current appropriation is $6 billion with another $6 billion expected in July 1982.

The corporation, created by the 1980 Energy Security Act, is supposed to support the establishment of a private synthetic fuels industry with public price, purchase and loan guarantees.

The effort "should not be thought of as a panacea to solve our energy problems," warned Chairman Ed Noble.

He promised that the corporation would "work diligently," keeping in mind that Congress envisioned an endeavor "of limited duration.'

"We will also guardedly watch the taxpayers' dollars," he said.

The new board, which still lacks two members, approved a corporation operating budget of $18 million, or 49 percent of what Congress authorized.

It also adopted policies requiring open meetings except under special circumstances and rejected a move to abolish an internal audit committee.

The board agreed to have an outside consultant make recommendations on proper salaries and fringe benefits for corporation managers, an issue that caused friction between Congress and the old board headed by John Sawhill.

The staff reported that one manager is still drawing a salary higher than that of Cabinet officials — $69,630.

Brazil's Coal Industry Examines Funding Requests for Mine Work

By BRUCE BARNARD 23B
Journal of Commerce Staff

RIO DE JANEIRO — The Brazilian state-owned coal company is examining $1 billion in funding requests for 28 new mining projects. Cost of associated equipment orders is expected to be $300 million.

According to Ney Webster de Araujo, president of the Companhia Auxiliar de Empresas Eletricas Brasileiras, the 28 proposals represent a potential increase of 14.7 million tons per year in Brazilian coal production. Of that, 13.2 million tons per year are steam coal and 1.5 million tons per year are coking coal.

The CAEEB is the major executor of Brazil's coal development program.

Mr. Araujo said the CAEEB already has approved eight new mine projects this year with a total installed capacity to produce 6.8 million tons of coal annually. Total investment cost for these will be $359 million.

Average cost of the 28 proposed projects is $53 per ton per year of installed capacity, based on $28 per ton per year for open pit mines, $39 per ton per year for shaft mines, and at least one long wall mine at $106 per ton a year of installed capacity.

The Journal of Commerce

Taiwan Expanding Ports to Handle Coal

10-30-81

By DONALD SHAPIRO 13C
Journal of Commerce Special

TAIPEI — Taiwan has begun an ambitious harbor development program. Unlike previous port expansions, which were aimed chiefly at accommodating Taiwan's rising volume of manufactured goods for export, this program is designed to facilitate imports — massive shipments of coal to help diversify the country's energy requirement.

According to a plan recently drafted by the Ministry of Economic Affairs, the volume of coal imports is expected to rise from this year's 6 million metric tons to 45 million by 1994. The biggest user will be the Taiwan Power Co., which has converted several existing plants to coal furnaces. In addition, the utility has decided that all future thermal plants it constructs will be coal-burning rather than oil-fired. The cement industry is also being prodded by the government to shift to increasing reliance on coal.

Three ports will handle the bulk of the incoming coal. The first to be developed is Kaohsiung, where construction is already well advanced on a special coal terminal at Talin at the tip of the harbor. Under a $30 million turnkey contract, Ishikawajimaharima Heavy Industries of Japan is building harbor facilities capable of accommodating ocean-going carriers of up to 125,000 deadweight tons.

Most of the coal will be transported by barge to an eight-unit power plant complex being constructed at Hsinta, about 30 miles up the coast of the northwest. The first unit, with generating capacity of 500 megawatts, is scheduled to become operational in early 1983.

The second largest coal port is being planned for Suao on the eastern coast, where a commercial harbor was built by the government during the 1970s as part of the nation's so-called "10 big projects." A joint venture formed by Estel Technical Services of Holland and Awan Wooster Engineering of Canada was selected to serve as the engineering consultant. The contractor will be picked by international tender next year.

Taichung harbor on the western coast, another of the "10 big projects," has been chosen as the site for the third coal-handling terminal. Annual capacity will be the same as for the Suro facility — 50 million metric tons per year at the final stage.

Total investment required for the series of projects could easily exceed $1 billion.

By the end of this decade, Taipower expects that coal will replace oil as its main fuel, accounting for 40 percent of power generation. Nuclear power is also being rapidly developed and will contribute 30 percent.

With the opening of its Kuosheng plant this month, Taipower now has three nuclear units in operation, and another three are under construction. Five foreign reactor supplies are competing for the contracts for units seven and eight, expected to be awarded at the end of this year, and further construction is slated to bring the total number of nuclear plants on the island to 22 by the end of the century.

Foreign companies are expected to find increasing business opportunities for nuclear power-related activities, including engineering and design, manufacture of components, and fuel fabrication and waste disposal.

Construction of coal-handling facilities is not the only factor adding to the activity at Taiwan's ports. In the first seven months of the year, loading and unloading of cargo exceeded 71 million metric tons for an increase of 4.63 percent over the same period last year. The rate of increase is likely to be over 6 percent for the year as a whole, in light of the midyear pickup that occurred in exports.

For shipping companies serving Taiwan, business conditions have varied widely depending on the route. The European trades are experiencing a slump, due mainly to the steep appreciation of the new Taiwan dollar in recent months, which has reduced the competitiveness of Taiwan's goods in that market. The downturn has affected the conference carriers more severly than it has Taiwan's own Evergree Line, which has garnered an estimated 30 percent of the European business through lower rates.

Business is reportedly much healthier than last year on the U.S. east and west coast routes. Rates remain low — an after-effect of last year's price war — but cargo volumes are rising. The improvement is attributed partially to President Regan's economic and trade policies, including the elimination of import controls on footwear, which have increased confidence among Taiwan's exporters.

The mini-boom in U.S. trades has given a boost to Taiwan's second biggest line, the government-owned Yang Ming Marine Line. The fast-expanding company has been concentrating on the U.S. routes, while Evergreen has cut back its American service to devote more attention to Europe. Yang Ming, however, is continuing with plans to inaugurate a north European service in mid-1982.

A third domestic line, Char Ching Marine Co., otherwise known as the C. C. Line, has been rapidly emerging as a major force in Taiwan shipping. It is concentrating on Red Sea, Eastern Mediterranean and Caribbean services, and plans to add routes to Australia and Latin America in the future.

THE JOURNAL OF COMMERCE, Tuesday, September 22, 1981

New Australian Facilities Will Boost Coal Handling

Journal of Commerce Staff

SACRAMENTO, Calif. — New coal terminals being built in Australia will allow the nation to handle some 95 million tons of coal annually by the end of 1982 and nearly 130 million tons by 1985, said Dudley Fagg, a senior trade commissioner with the Australian consulate.

Mr. Fagg, speaking at a coal export conference sponsored by the American Association of Port Authorities, said port projects under way to handle steam coal include:

— Terminal expansion at Balmain, due to be completed soon, which will allow the harbor to handle Panamax-class vessels. Capacity will be increased from 2.5 million tons per year to 4.5 million tons.

— The expansion of the channel loading facility at Newcastle, which involves building a second berth. This project is due to be finished in 1982 and will allow the port to handle vessels of 120,000 deadweight tons.

— A third facility is planned on Kooragang Island in Newcastle harbor. The first phase, which will provide an export capacity of 15 million tons is expected to be completed in 1984. Vessels of 120 deadweight tons will be able to call at the facility, whose eventual capacity will be 50 million tons.

— An interim coal terminal with a capacity of 3 million tons will also be built at the mouth of the Brisbane River, Queensland, while a larger facility will be considered for the site. Initial plans call for serving Panamax-class ships.

— Gladstone harbor is being deepened to allow ships of 150,000 tons to call at the Clinton loader facility. The project is expected to be completed in 1982.

— Construction has begun on a new facility at Dalrymple Bay which will be able to handle vessels of at least 150,000 deadweight tons and is scheduled to open in mid-1983. And, a new coal port at Abbot Point near Bowen, Queensland, which is designed to serve ships of 160,000 deadweight tons is due to begin service during 1984.

The Port of Rotterdam, in a report distributed at the conference, said it will build a new coal terminal at Maasvlakte to ultimately handle 25 million tons of coal annually by the 1900s and to serve ships up to 300,000 deadweight tons.

A pilot facility to unload and store coal slurry mixtures will also start at Maasvlakte in 1982, and there are plans to set up two pilot plants for coal gasification.

Rotterdam, Europe's biggest coal port, last year handled 10.8 million tons or about 20 percent of West European coal transport shipments. About 40 percent of the foreign coal brought into the port is destined for consumption in the Netherlands.

The Port of Rotterdam will build a new coal terminal at Maasvlakte to ultimately handle 25 million tons of coal annually by the 1990s.

The Journal of Commerce 11-17-81

Coal, Electric May Join Mexico's Exports to US

By STANLEY MANTROP 238
Journal of Commerce Staff

HOUSTON — Coal and electric power could be joining gas and oil as Mexico's energy exports to the United States if agreements can be reached with power and city officials in the Southwest, it was learned here.

Seeking to capitalize on rising rail costs for moving western coal into the region, the Mexican government hopes to offer an alternative from surplus coal supplies along the U.S.-Mexican border.

The proposal from Mexican power authorities is being given considerable attention from many parts of Texas and Mexico which have seen rail rates for coal in recent months almost double their utility costs.

Mexican officials plan to meet in Mexico City this week with San Antonio civic and utility officials as the first step in getting a large scale power and coal traffic moving over the Rio Grande, and other meetings are also planned.

The coal would be shipped in from the newly-activated mines at Piedras Negas where the government expeects a surplus of coal.

The Piedras Negras coal field is expected to account for more than 70 percent of Mexico's potential exports.

At the moment, the coal is expected to provide raw materials for seven Mexican border power plants serving the interior as far south as Monterrey and along the Texas and New Mexican borders.

Prior to the opening up of the Mexican coal mines and the power plants, San Antonio hoped to work out a power-oil exchange with Mexico through the construction of a 168-mile power line to the border at Piedras Negras, but the inability to work out an oil export deal at the time put the project on the shelf.

However, with the situation now reversed, Mexico is seeking to capitalize on the previous planning by offering the hard-pressed Southwest with an alternative.

A spokesman for the Mexican-government-owned Minera Carbonifera Rio Esconidido SA, which is handling the Piedras Begras coal and utility operation, said Mexico is anxious to work out joint agreements with potential U.S. utilities.

While short-term power agreements have been worked out with U.S. utilities along the border in the past, this effort, if successful, would make the first time an agreement would be worked on a long-term basis which both feel is essential.

HYUNDAI

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Jan 28, 1981

United States of Senate
Committee on Energy and
Natural Resources
Washington, D.C. 20510

Att: John W. Warner-Chairman, Subcommittee on Energy and Mineral Resources

Re: Written statement for hearing record

Gentlemen:

We thank you for your letter of Nov 24, 1981 in which you invited us at hearings for testimony.

Though we were unable to testify in person, we still have the pleasure to submit written statements as attached to this letter.

We hope the statements will be of some help for the hearing's purpose and will be pleased to answer any further questions or meet with your requirements, if any.

Very truly yours,
Hyundai Corp(USA)

S. T. Lee
Senior manager

encl.

1. State of Coal Industry

(1) Anthracite Coal

o Minable Reserves

(1,000Ton)

Calorific Value	Over 5200 Kcal/Kg	4200-5200 Kcal/Kg	below 4200Kcal/Kg	Total
Minable reserves	225,065	252,498	636,626	1,114,189
%	35.4	25.0	39.6	100

o Expect to rise in demand of coal import due to higher increase rate of consumption than that of production.

- Increase rate of production : 2.5% (1981 - 1986)
- Increase rate of consumption : 2.8% (1981 - 1986)

(2) Lituminous Coal

o Rely totally on import

2. Prospect for coal demand)

(1) Bituminous Coal

(Unit ; 1,000MT)

USAGE \ YEAR	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
METALURGICAL	5,239	5,957	6,547	6,150	8,450	8,980	10,769	10,375	12,121	12,593	14,343
INDUSTRIAL	1,633	2,218	2,406	2,445	4,400	5,573	7,688	9,734	11,926	14,298	16,862
POWER GENERATION	-	1,336	3,947	4,204	4,699	4,579	5,055	5,728	6,626	7,695	8,196
TOTAL	6,872	9,511	12,900	12,799	12,709	19,312	23,512	25,837	30,673	34,586	39,401

(2) Anthracite Coal

(Unit : 1,000MT)

CLASSIFICATION \ YEAR	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
STOCK FROM PREVIOUS YEAR	5,832	5,778	5,700	5,700	5,700	5,600	5,600	5,500	5,500	5,500	5,500
PRODUCTION	18,500	18,600	18,700	18,800	18,900	19,000	18,800	18,600	18,400	18,200	18,000
IMPORT	4,120	4,610	4,680	4,610	4,530	4,560	4,530	4,490	4,400	4,160	3,990
TOTAL	28,452	28,988	29,080	29,110	29,130	29,160	28,930	28,590	28,300	27,860	27,490

* SOURCE : MINISTRY OF ENERGY & RESOURCES

SEPT., 1980

3. Hyundai's Coal Import (1981)

(Unit : Ton)

	USA	ASIA	SOUTH AFRICA	Total	REMAKRS
Steaming Coal	44,000	90,000	30,000	164,000	Cement Cos
Anthracite Coal	33,000	104,000	-	137,000	PARTICIPATE IN DHCC TENDER

Import Plan for 1982

o Steaming Coal 400,000 Ton for Cement

Specification

Ash (on dry basis) : 10% Max.
Volatile Matter (on dry basis) : 25-30%
Sulphur (on dry basis) : 1.5% Max.
Moisture (As received basis) : 8% Max.
Calorific Value (on dry basis) : 6,800Kcal/Kg Min

4. Hyundai's Foreign Investment in overseas coal mine development

(1) Steaming Coal

Drayton Project

- Country : Australia
- Location : 10 Kilometres South east of Muswellbrook
- Reserves : 440 Mil Ton
- Minable Reserves : 110 Mil Ton
- Scale of production : 3.2 Mil per year for Steaming
- Total investment in Drayton : A$340,000,000
- Hyundai's investment in Dryaton : A$8,893,000 for 10 years
- Companies involved in Drayton :

CSR Ltd	44%
Shell Australia	39%
AMP	7%
Mitsui Mining	3%
Mitsui Coal Develop	2%
Hyundai	2.5%
Dae sung	2.5%

(2) Anthracite Coal

ALASKA project

See Attached sheet

BERING RIVER COAL PROJECT, ALASKA

December, 1981
Korea Alaska Development Corp.

1. History

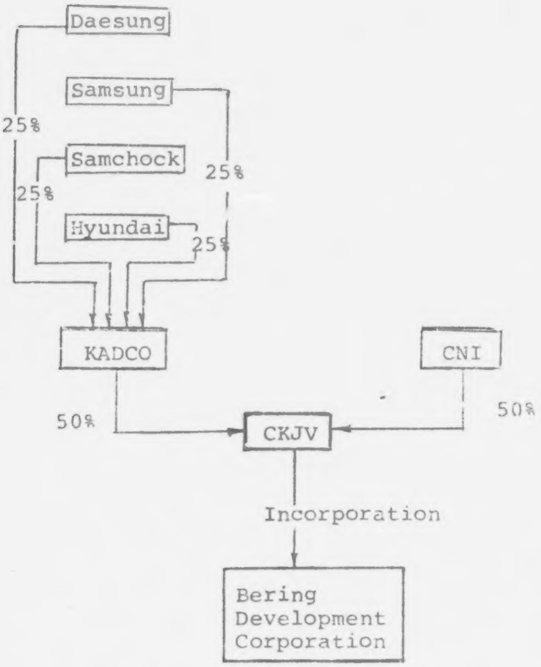
'81/3/18	Chugach Natives Inc.(CNI) submitted applications for Exploration Licenses, 75,000 acres of Bering Coal Field to BLM.
4/9	Agreement was signed for joint development of Alaska resources among Hyundai Corp., Samsung Co., Ltd, Samchock Coal Co., Ltd and Daesung Coal Co., Ltd.
4/18	Basic Agreement was signed for joint development of Bering River Coal Field and establishment of a new Joint Venture company between CNI and 4 Korean Companies.
5/1-5/30	Basic geological survey for initial drilling was carried out by KMPC-KADCO survey team.
5/18	Execution of Drilling Contract (9,000ft, U$750,000) between CNI/KADCO and Interstate Exploration Inc.
5/28	CNI obtained Exploration Licences by BLM.
6/10	Despatch of the second survey team for management of drilling program and extended geological survey
6/5-6/15	All Permits and/or Licences were issued by BLM, USFS, USGS, USBM and/or Acheologists.

6/15-7/30	Drilling Program was carried out (9450ft,16 Holes)
7/2	Establishment of Korea Alaska Development Corporation (Issued Capital: ₩500,000,000.- Representative Director : Mr. YW Park)
7/20-7/30	Board members of KADCO, composed of top managements of 4 share holding companies visited Alaska
7/25	Technical consultancy Agreement for Photogeology and Accessability was signed between KADCO and Golder Associates, U.S.A.
9/1-9/25	Preparation of Geological Report for Conclusion of exploration works
9/30	Notice of Development Area (30,000 acres) for CNI's Land selection.
'81/12	Completed Initial Land Selection of 200,000acres by CNI, in which Bering Coal Field included. Agreed, in principle, Joint Venture and Shareholders Agreement Draft by CNI and KADCO.

* In the case that feasibility is proved through a series of Exploration programs and feasibility study, the development of 1,000,000-2,000,000 TPY production scale will be commenced.

2. Description of Project

1) structure



2) Roles of Parties

KADCO:

- * Management of Exploration Program
- * Investment for '81 Exploration Program
- * Loan Arrangement for Fund of Exploration and Development
- * Management of Bering Development Corp.

CNI :

- * Acquisition of all rights and/or permits for coal development
- * Transfer of all rights and/or permits acquired to EDC

3) Present status

Location	60°N 144°W	
	300Km east of Anchorage	
	100Km east of Cordova	
	34Km northeast of Katalla	
Access	Anc-Cor	: Daily Commercial Flight
	Cor-Site	: Fixed wing float plane by charter
Climate	Rainfall 200 inches	
	Temperature Summer	5-20°C
	Winter	0-25°C
Topography	Small mountains and hills 0-700m from Sea Level, with many streams. Partially covered by spruce or snow	
Area	Exploration 75,000 acres	
	Development 30,000 acres	

Coal Deposit

Structure : complexity with foldings and faults

Outcrop : Over 100 places

Number of Coal seams : 3-5

Thickness of coal seams : over 2.0m

Drilling Results : Attached.

3. '82 Project of BDC

1. Exploration
   Drilling 3,000M
   Trench 20 places
   Electric Logging (if necessary)
   Employment of Consultant for Report
2. Survey of Economic Factors
   Study of the possibility of Infrastructure Aid
   General Factors for Development and Production
3. Staffing

Schedule of '82 Project

82/1/End	Signing Agreement Lease Agreement(initial) Loan Agreement(initial)
82/2/Early	Meeting of KADCO's BOD Finalization of 82 Project
82/2/Middle	Dispatch Korean officers of BDC
82/2/End	Obtaining BOK's Permit
82/3/Early	Establishment BDC Lease Agreement Loan Agreement
82/3/End	Bid for Drilling Employment of Consultant
82/5/Middle	Commencement of Drilling
82/8/End	Completion of Exploration
82/9/End	Completion of Report

* Signing Agreement,Establishment of BDC and Land Selection by CNI should be settled before all the 82 Project commencement.

4. Requirements to the U.S. and/or Alaska State Governments

To make fund available for the study of infrastructure such as Harbor, Transportation Facilinies and Township.

To make fund available for the construction of infrastructure in case thot project is viable.

General Assistance for employment of stable labor.

TABLE OF COAL RESERVES
BERING RIVER COAL FIELD (CNI/KADCO MINE REGION)

	Area	Strike Length (M)	Depth (M)	Thick-ness (M)	Increasing Rate (cosec θ)	Specific Gravity	Reserves (M/T)	No. of Coal Beds	Total Reserves (M/T)	Recovery (%)	Minable Reserves (M/T)
					80°						
Probable	Carbon	4,500	300	2.3	1.01	1.3	4,076,000	3	12,228,000	70	8,559,000
Possible	creek	4,500	300	1.0	1.01	1.3	1,772,000	2	3,544,000	50	1,772,000
					40°						
Probable	Trout	13,700	300	1.5	1.55	1.3	12,422,000	2	24,844,000	50	12,422,000
Possible		13,700	300	1.0	1.55	1.3	8,281,000	2	16,562,000	"	8,281,000
					45°						
Probable	Clear creek	4,500	300	1.5	1.41	1.3	3,711,000	3	11,133,000	50	5,566,000
Possible	& Ridge	4,500	300	1.0	1.41	1.3	2,474,000	2	4,948,000	"	2,474,000
					30°						
Probable	Carbon	17,000	300	1.5	2.0	1.3	19,890,000	3	59,670,000	50	29,835,000
Possible	mountain	17,000	300	1.0	2.0	1.3	13,260,000	2	26,520,000	"	13,260,000
Sum of Probable									107,875,000		56,382,000
Sum of Possible									51,574,000		25,787,000
Total									159,449,000		82,169,000

APPENDIX B

SUMMARY OF DRILL RESULTS

Drill Hole No.	Location	Depth (M)	Date	Core Recovery (%)	Drilling Co.	Drill site Elevation (M)	Coal Seam Elevation (M)	True Coal Thickness (M)	Dip
K-81-1	Carbon creek	170.0	81. 6.19 – 6.22	100	Interstate Exploration Inc.	380	344.5	0.6	90°
							261.1	1.1	85° NW
							237.0	0.6	"
							231.0	0.75	"
K-81-2	"	180.0	6.19 – 6.22	97.0	"	382	375	1.2	90°
							370.4	4.4	"
							273.4	1.1	"
K-81-3	"	204.0	6.4 – 6.18	99.0	"	366	250.4	2.7	90°
							183.0	0.5	"
							170.0	1.8	"
K-81-4	"	167.0	6.22 – 6.26	79.0	"	358	350.4	2.8	80° NW
							309.8	5.8	"
							287.0	6.7	"
							242.5	9.10	"
K-81-5	"	212.0	6.9 –6.18	92.0	"	335	327.5	11.9	70° NW
							306.7	9.1	90°
							230.4	2.6	85° SE
K-81-6	"	176.0	6.22 – 5.25	100.0	"	325	294.2	0.7	80° NW
							247.7	1.1	85° NW
							238.9	1.8	"
							140.7	7.5	"
							262.3	0.8	70° NW
							245.9	3.3	80° NW

Drill Hole No.	Location	Depth (M)	Date	Core Recovery (%)	Drilling Co.	Drill site Elevation (M)	Coal Seam Elevation (M)	True Coal Thickness (M)	Dip
K-81-7	"	165.0	7.5 – 7.9	89.0	"	305	230.9	0.8	"
							169.0	0.5	90°
							154.4	0.6	"
K-81-8	"	209.0	7.1 – 7.6	99.0	"	305	288.6	0.5	90°
							257	0.6	"
							242.5	0.9	"
							237.2	0.9	"
							127.3	1.6	80° NW
K-81-9	"	169.0	6.28 – 7.3	92.0	"	305	269.6	1.5	75° NW
							156.9	0.75	70° NW
							150.3	3.2	"
K-81-10	"	163.0	6.27 – 6.30	95.0	"	389	198.0	4.8	85° NW
							170.4	2.2	"
							150.3	1.4	75° NW
K-81-11	Carbon mountain	202.0	7.7 – 7.13	100.0	"	533	500.10	1.9	25° NW
							412.6	0.47	20° NW
							374.4	1.3	30° NW
							343.7	0.2	20° NW
K-81-13	"	153.0	7.13 – 9.15	100.0	"	543	481.7	1.1	30° NW
							454	1.3	20° NW
							417.9	0.3	30° NW
K-81-14	Clear creek	166.0	7.27 – 7.29	92.0	"	213	116.10	2.4	50° NW
							67.3	3.4	30° NW
	Trout						114.4	1.65	15° NW

Drill Hole No.	Location	Depth (M)	Date	Core Recovery (%)	Drilling Co.	Drill-site Elevation (M)	Coal Seam Elevation (M)	True Coal Thickness (M)	Dip
K-81-15	creek	121.0	7.7 – 7.15	91.0	"	152	111.2	7.5	"
							101.1	6.0	"
K-81-16	"	198.0	7.20 – 7.24	100.0	"	137	102.1	0.3	50° NW
							−1.8	0.2	50° NW
							−2.6	2.3	"
K-81-17	"	228.0	7.20 – 7.24	94.0	"	146	100.0	2.3	50° NW
							25.6	0.9	"
							−18.9	1.4	"
							−35.7	0.5	70° NW
							−37.8	0.5	"
							−68.0	1.7	"

APPENDIX C

ACID TEST RESULTS

Drill Hole No.	Planned Angle	Drill Angle	Deviation (%)
K-81-11	90°	89° 50′	0.185
K-81-13	90°	89° 30′	0.55
K-81-14	90°	90° 00′	–
K-81-15	90°	89° 00′	1.11
K-81-16	60°	59° 00′	1.66
K-81-17	60°	61° 00′	1.66

5.0 COAL QUALITY

Drill Hole No.	No. of Coal Sample	Moisture (%)	V.M. (%)	Ash (%)	F.C. (%)	S (%)	Kcal/Kg
K–1	1	0.26	12.9	20.1	67.0	0.60	6,980
	2	0.30	14.4	5.66	79.9	1.10	8,410
K–2	1	0.70	15.2	4.35	80.5	0.60	8,510
	2	0.77	15.2	2.49	82.3	0.98	8,700
	3	0.75	15.9	2.59	81.5	0.62	8,720
	4	0.58	13.6	8.27	78.1	0.64	8,110
K–3	1	0.73	14.3	8.14	77.6	0.66	8,190
	2	0.70	15.6	9.59	74.8	0.62	8,000
K–4	1	0.78	14.5	14.8	70.7	0.98	7,440
	2	0.50	15.0	5.94	79.1	0.84	8,380
	3	0.22	13.6	19.8	66.6	1.16	7,050
	4	0.70	12.7	16.7	70.6	1.90	7,330
K–5	1	0.10	11.9	19.4	68.7	1.74	7,030
	2	0.20	13.4	16.4	70.2	3,20	7,250
	3	1.47	15.7	21.2	63.1	0.64	6,240
K–6	1	0.12	14.4	18.3	67.3	0.62	7,060
	2	0.13	15.1	7.26	77.6	0.66	8.020
	3	0.48	14.1	6.96	78.9	0.76	8.260
	4	0.25	14.2	13.6	72.2	5.22	7,580
	5	0.55	14.2	2.24	83.6	0.94	8,710
K–7	1	0.33	12.9	30.3	56.8	0.68	5,930
K–8	1	0.59	12.9	4.24	82.9	0.70	8,510

Drill Hole No.	No. of Coal Sample	Moisture (%)	V.M (%)	Ash (%)	F.C. (%)	S (%)	Kcal/Kg
	2	0.14	11.8	34.1	54.1	2.30	5,580
	3	0.25	12.4	20.5	67.1	0.54	6,950
K-9	1	0.31	13.7	2.82	83.5	1.12	8,700
	2	0.33	13.0	5.54	81.5	2.62	8,390
K-10	1	0.57	14.5	3.17	82.3	0.78	8,600
	2	0.20	11.6	41.1	47.3	1.28	4,970
	3	0.75	13.3	19.7	67.0	1.18	7,090
K-11	1	0.50	8.91	11.0	80.1	5.10	7,660
	2	0.01	2.84	16.2	81.0	0.28	6,760
K-13	1	0.44	7.39	3.92	88.7	0.80	8,350
	2	0.47	7.02	11.1	81.9	0.76	7,700
K-14	1	0.67	9.61	17.7	72.7	0.78	7,220
K-15	1	0.52	12.0	50.6	37.4	0.40	6,450
	2	1.05	16.2	4.57	79.2	0.66	8,500
	3	1.79	15.8	2.96	81.2	0.70	8,740
K-16	1	0.51	12.2	44.7	43.1	0.80	4,640
K-17	1	0.70	9.35	64.3	26.4	2.62	2,870
	2	0.36	14.4	13.2	72.4	1.54	7,670
	3	0.50	15.9	17.5	66.6	1.80	7,290

5. Suggestions for America's Coal Export Industry

(1) Upgrade of railroads to enable them to accomodate the large unit trains

(2) Increase the loading capacity at coal exporting ports

(3) Construction of infrastructure to develop Alaska coal project.